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PREFACE TO SECOND EDITION

THE frontiers of medicine have far advanced since the first edition of this book was published, but the disciplines of clinical method in diagnosis remain unchanged in essentials Consequently no drastic changes have proved necessary for this edition, though some new methods and conceptions have been incorporated, and we have added a new chapter on the basic principles of the 'acute abdomen'

We were tempted to add new material on the social and psychological background of illness, but ten years' further experience convinces us that these aspects, vital though they are, can only be appreciated in outline by the student in his early hospital years He must first learn his way among the simpler physical conditions

J M N
J A

January, 1960

PREFACE TO FIRST EDITION

This book has been written expressly for students receiving their clinical training in medicine It is intended for those bewildered young men and women who, suddenly removed from the orderly domain of Science, cross the No-Man's-Land into the strange, empirical atmosphere of the wards, the casualty room, and the out-patient clinic

"Why", asks the bedevilled student, "why does my teacher diagnose pneumonia just by examining the chest, when he tells me to examine every patient from head to toe?" The abandonment of the old system of clinical apprenticeship has led to many such quandaries The "Chief" is still the man from whom students learn most of their clinical medicine, and rightly so, but under modern conditions the time they spend together is pitifully inadequate It is hoped that this book will fill some of the gaps, and show why it is that precept is not always followed in practice Since nowhere is the separation of precept from practice more marked than in dealing with acutely ill patients, we have divided this book into two sections, entitled "Examination at Leisure" and "Examination of Acute Cases" This has been done to meet a real difficulty, and to emphasize a principle—that the practical aim of examination in an acute case is to establish a provisional diagnosis on which to base immediate treatment, but without undue disturbance of the patient

It is appreciated that to learn an art in which empirical knowledge often counts for more than logic, the student must adapt himself to practical difficulties and develop new methods of approach Although we have attempted to interpret certain symptoms and signs in terms of physiology and anatomy, we realize that a true synthesis can be achieved only by careful

study at the bedside, and one purpose of this book is to emphasize the importance of this discipline This, then, is a book about methods of examination and the difficulties associated with them Since several comprehensive works on physical signs and diagnosis exist already, we ourselves have not attempted to give a comprehensive account; but, by concentrating on essentials, we have tried to make clinical technique stand out as a vivid and understandable whole

Many doctors going out into practice become so disillusioned that they abandon nearly everything they learned in hospital Like James Mackenzie, they find that nine-tenths of their hard-earned knowledge is useless, and that they are ignorant of those apparently intuitive processes by which the Chief makes diagnosis and prognosis It seems as if the diagnostic weapons we help students to forge are too massive and unwieldy for everyday use, they are better suited for the examination hall than for the surgery With all the more singleness of purpose, therefore, must essentials be taught and non-essentials be eschewed Only sound principles and sound methods will emerge triumphant from that ultimate testing chamber, the doctor's surgery In attempting, however inadequately, to reach these ideals we have tried to keep readers of this book by the bedside, where the craft of medicine can truly be mastered

Perhaps the greatest difficulty encountered by the serious student of medicine is that, while attempting to build a stable structure on the experience and knowledge bequeathed by others, he must strive to maintain a readiness to change, both in accordance with his own changing requirements and with changes in the practice of medicine We have not hesitated to incorporate in this book some modifications and departures from accepted practice, not so much to illustrate what we have found useful and suitable for ourselves, but as an example to our student readers to work out their own methods on the basis of what their own individual experience teaches

It is a pleasure to thank Dr. Alice Stewart and Dr Nora Naish for reading the proofs and for their helpful criticisms We are also grateful to several of our students for constructive suggestions To Professor C Bruce Perry our thanks are due for making freely available to us his collection of clinical photographs, and we are indebted to Dr. M J Dunne for taking several photographs specially for this book. Finally, our grateful appreciation is due to the Publishers for their invariable courtesy and help in passing this book through the press

May, 1948

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EXAMINATION AT LEISURE

CHAPTER I

INTRODUCTION

THIS is a book about the ways in which it is possible to learn from patients A framework of technique is suggested which can form the basis for the development of your powers of observation

One of the most deeply satisfying advances you can make is to modify a standard technique to suit your own needs, but it is not good to depart from the well-worn paths merely for the sake of novelty, or as a concession to laziness, or in a misguided attempt to save time The clinical teacher represents the hard won experience of many generations, yet all the time progress is being made, and it should be an encouragement to realize that apprenticeship can be more than mere imitation

You must first of all learn to examine and to assess your cases at leisure For these purposes chronic cases are ideal They allow you time to re-examine when uncertain and you will often be in doubt at first, they allow time to think to read, and to question—not only your teachers and your books, but yourself The first part of this book is accordingly devoted to the technique of examination of non-acute medical cases, as a foundation on which to build

Acute cases present very different problems you cannot be expected to tackle them until you have learned the basic technique on chronic cases If you watch a physician examining an acutely ill patient, such as a man in coma you will observe that his approach differs greatly from that which he adopts with a patient suffering from some chronic condition He is

examining with a view to immediate diagnosis; diagnosing with a view to urgent treatment. The ability to do this is a hallmark of medical maturity The difference in approach is difficult to describe and slow to acquire, yet it remains vital We are attempting to illustrate it for you by discussing some common medical emergencies in the second part of this book

Above all, however, remember that it is essential to know the normal before you can appreciate what is abnormal The more you know about what constitutes good health the easier you will find it to recognize the patient with early signs of disease. Throughout this book you will find us emphasizing the maxim—"Know the normal". Begin by examining your own friends, it is a good test of friendship Examine the hearts of abdominal cases and the abdomens of cardiac cases

Important as it is to recognize the earliest signs of ill health, it is usually unwise to base a diagnosis on a single abnormal physical sign. Such a finding will put you on your guard, but you should continue to search for further confirmation or disproof, and remain sceptical until one or other is found Finally, may we remind you that a patient is a person not a case illustrating a disease When you consider a patient with a duodenal ulcer you should think of "the whole and not the hole".

This introduction ends with a warning If you believe unquestioningly all that is told you, we shall have failed you and you will have failed yourself The essence of all learning is to ask—'Why?'

CHAPTER II

THE APPROACH TO THE PATIENT

When you are allotted your first 'case', and find yourself confronted with a patient who is perhaps hostile, perhaps overtalkative, or perhaps just amused by your efforts, you are to be forgiven for feeling embarrassed, confused, and lost When the years have rolled by and you look back upon that day it will not be easy for you to define just what you have gained in the intervening years to make an interview with a patient, once so difficult, become a stimulating adventure Experience of disease, certainly, you will have gained, and confidence too, but perhaps most important of all you will have learned how to deal with people You will have learned how to coax a history out of a taciturn man, to persuade a sullen child to co-operate, to calm the fears of an anxious woman so that she can tell her story coherently, and to be patient with a garrulous man, knowing that in the midst of all his verbosity he will quietly let drop the facts you have been waiting for Even your Chief, with all his experience, may find it difficult to fit together the jigsaw puzzle of which the patient has presented you with only a few random pieces, but to you at the beginning of your career it seems a hopeless task It is not hopeless, every doctor has gone through this stage, though some take longer than others If you can avoid some of the common pitfalls you will all the sooner be able to get down to the real job of doctoring

Do not start with the idea that taking a history will ever be an easy process The more you will learn the more will the horizon widen for you and the more difficult will it seem to be to fulfil your dream of the 'perfect history' The perfect history lies in the imagination, an ideal always impossible of complete attainment So the *first principle* is the principle of humility—try for all that you can but do not expect the absolute truth

The *second principle* concerns you and your patient, and will govern the relationship between you, whether you see him

for five minutes or whether he remains under your care for twenty years It is this: not only must you want sincerely to help your patient, but you must let him see that you are on his side It is easy to be irritated by a talkative man who wastes your precious time, to speak sharply to someone you know to be exaggerating, and to resent the patronizing manner of one who thinks herself a great lady; but if you show hostility the patient will sense it at once and will fail to come out into the open or to speak the truth as nearly as he can You must not allow this to happen The best way to guard against any possible misadventures in this respect is to —

Let the patient talk. This is the *third principle* When he is talking he will be happy, he will feel that you are on his side because you are listening with interest, he will overcome his initial shyness and become more coherent The time you may lose by listening to a few minutes of irrelevant gossip will be repaid to you later in the ease with which you can extract the essential facts you have to know. Besides, from amidst the confusion of talk you may suddenly hear the sweet sound of a brilliant description of a symptom—"like someone squeezing the inside of my chest every time I hurry"

You must be friendly, therefore, to all your patients When you know what sort of person you are dealing with, you can afford to vary your manner With a nervous or anxious patient you can be completely confident and yet essentially sympathetic With a patient who is over-acting and over-describing his symptoms you can afford to be firm With the rather hostile patient who doesn't "think there's much the matter", "has never had a day's illness", and "never held

the case of a child, let the mother talk Meanwhile get the child to play, gradually joining in yourself later Unlike adults, children may become reticent and withdrawn if you take an immediate and direct interest in them They respond and become co-operative if you demonstrate that you are on good terms with the parent, and attempt to gain their confidence only when that first objective has been achieved

The *fourth principle* governing your interview is that you must extract from the patient's talk and by your own questions

this fundamental piece of information: *the real reason* why he is consulting you It may be a simple catastrophe, such as a broken wrist or a hæmatemesis, which has just befallen him, all is then plain sailing But perhaps he comes complaining of a pain which has been present in the shoulder for two years There are innumerable reasons why he should consult you The pain may have become gradually worse so that he cannot sleep, it may be preventing him from moving his shoulder so that he cannot work, it may have been very severe on one particular day so that he became alarmed, or his wife may have sent him because he was becoming more and more irritable. It is up to you to sort out these things and discover the real reason By doing so you gain a most valuable insight into your patient's mentality, his work and background, and his disease; without doing so you cannot take a satisfactory history

Let us take another example, one common enough in ordinary practice A patient complains that "All the food I eat comes up again at once" Looking at the patient you may know that his statement cannot be exactly true because he is fat and the symptoms have been present for six months It is essential for you to find out the real reason why he is consulting you The so-called vomiting, obviously little more than eructation, is not likely to be the real reason but merely a manifestation of some other disturbance, physical or mental, which makes him fear or need help While searching for this, try to discover how much the symptom interferes with his work and normal life, and for how long it has been present This will bring you to the important question of the onset of the symptom

The Onset of Symptoms.—You will find that most sufferers from chronic disease are very vague on this point, whereas those with acute symptoms can usually give the day and the hour when they began to feel ill Seize on this information, and don't let it escape from your mind or your patient's while you make him trace for you the progression of his symptoms between their onset and the time of the interview When more than one symptom is present you must carefully elucidate the order of their appearance and their relative severity, for this information is often vital to diagnosis

Another very important fact to elicit is whether the symptoms have varied in intensity since they began For instance,

dyspepsia which is severe for about a week and then easier for about two weeks is suggestive of peptic ulceration, whereas progressively worsening dyspepsia is more typical of carcinoma of the stomach

If pain is present anywhere you should make ten distinct inquiries * you should want to know two things about the pain itself (its character and severity), three things about its location (site of maximum intensity, area of maximum spread, and its radiations to other areas), three things about its time relations (date of onset, length and time of attacks, and periods of freedom), and, lastly, what makes the pain worse and what makes it better Let us apply this plan to an ordinary case of headache

A young man, aged 19, complains of headache, very severe and throbbing in character It is maximal over the right eye, extends over the right side of the head and sometimes shoots down the back of the neck He has suffered from attacks of such pain since he was 14 years old They usually begin first thing in the morning and last about seven hours, they occur about once in every three weeks, but more frequently when he is working for an examination, or when he is over-tired or worried, and they are partially relieved by rest and aspirin

A history such as this would suggest the common malady of migraine *Unless you are prepared to obtain such a thorough history of the pain it will be impossible for you to diagnose the condition, since you are not likely to find any abnormal signs on physical examination*

Review of Symptoms —It is necessary to bring to light other symptoms which the patient may not think relevant to his

you will want to know more about it for instance, whether a cough is severe or slight, moist or dry, how long it has lasted, whether it is worse in summer or winter, whether it occurs in paroxysms or singly, and at what time in the twenty-four hours, what brings it on, and what relieves it

You must to a certain extent shape your inquiry according to the patient's symptoms If he complains of pain in the

* *See* Ryle, J A, *The Natural History of Disease*, 1948, 2nd ed, Oxford Univ Press

chest you will ask whether he has a cough or breathlessness or has coughed up blood; if he complains of abdominal symptoms you should ask first about his weight, appetite, and bowel and urinary functions. The exact form your history should take cannot be foretold at the beginning of the interview. As you go along you will mentally sort the information and decide on the next stage of inquiry

There is, therefore, much about symptomatic inquiry that can only be learned by experience, and it is not appropriate at this stage to go into detail; but we would like before leaving the subject to ask you always to remember to inquire about the patient's weight and weight changes This knowledge will always be valuable.

The Past History.—When you have built in your own mind a picture of what the patient's real symptoms are, when they began, and how they have affected his life, you should turn the patient's mind back to his past history his childhood, usual health, education, marriage, the vitally important question of occupation, his habits and life generally Certain occupations cause specific diseases such as silicosis, while other diseases occur more commonly in men of a certain class or occupation for reasons which are not yet well understood Habits such as cigarette smoking go with an increased susceptibility to lung cancer, and the heavy drinker is liable to develop cirrhosis of the liver

Family History.—You should inquire about the stock from which he was born, the health or disease of its members, their longevity and character The past history and family history should not be just a catalogue of childish ailments from which the patient has suffered, and the diseases from which his parents died A good past history is an expression of your estimate of the man his past, and the stock he sprang from For example "This farm labourer, of 36, was born of healthy stock into a large family His childhood was marred by two long illnesses (probably rheumatic fever) at 7 years and 14 years of age respectively His education was, therefore, much interrupted, and on leaving school he was unable to take up more than unskilled employment After working as an errand boy for four years he obtained steady employment on a farm He married at the age of 28 and has had three children His present symptoms cough and breathlessness, he has noticed occasionally

since the age of 30, but the breathlessness has been so severe recently that he has not been able to carry on his work for three months "

When you have finished 'receiving' the history—it should be 'received' not 'taken'—you will know a good deal about the man you are dealing with, whether he is a moderate man or a murderer, a moron or a magnificent liar You should also know something about the disease which has attacked him and how he has responded to it Lastly, you should know whether he is very ill or merely mildly inconvenienced

SUMMARY

There are four overriding principles When receiving a history:—

1. Adopt an attitude of humility towards the problem presented
2. Let the patient see you want to help him
3. Let the patient talk
4. Find out the real reason why the patient came to you

Your inquiry must start with the onset of the chief symptom, then develop along lines which can be determined only as you go along, and end with a general survey of the patient's past, his life and work and stock

CHAPTER III

GENERAL SURVEY

THE ADULT

COMPARATIVELY few patients show those interesting physical signs which are so attractive and striking when demonstrated in the wards or pictured in a book. So, if you rely merely on an unimaginative overhaul of your patient, system by system, you may be at a loss for a diagnosis when some important clue stares you in the face, you will be in the humiliating position of the man who turns his house upside down in a search for spectacles which all the time are on his own head. Therefore, attune yourself, like Sherlock Holmes, to observe minutely from the moment you see your patient and to be ever on the watch for details as well as to obtain a general impression. Much

Approach your patient with your eyes wide open. Much that is described in the following pages can be noticed while you are hearing the patient's story. After listening to his main complaint, it is a good plan to feel his pulse and look at his tongue, making the other general observations while the patient talks to you.

Just as in your studies of histology you have learnt to look first with your naked eye at the slide and only later with the low- and high-power objectives, so in the practice of medicine you must first survey your patient as a whole, and then later focus your attention on particular parts of his body. To make a spot diagnosis is not a sign of clinical laziness but of superior powers of observation. To leave that spot diagnosis unconfirmed is however most culpable negligence.

FIRST STAGE. GENERAL OBSERVATION

The Mentality.—The good clinician during every moment spent with his patient is absorbing a general impression of his mentality. Is this within the range of normal? (The measuring sticks must be the clinician's own mind and his experience of human beings.) If abnormal, does the patient under react or

over-react to his illness? One man's agony is another man's ache, you must know what sort of man you are dealing with This is important [illegible]

intelligence, or he may appear slow-witted because of some emotional disturbance

The two most common emotional reactions of patients are anxiety and depression, sometimes a combination of both Many patients show some anxiety in the presence of a doctor their hearts beat rapidly and they sweat and tremble; but do not attach too much importance to these unless you find other evidence of more long-standing anxiety such as heavily bitten finger-nails, rapid self-conscious breathing, clenching of the hands, talkativeness, jerkiness of movement, and a hunted look such as is seen in students before their 'Finals'

It is most important to recognize the depressed patient, for he may not always have enough insight into his condition to tell you he is depressed, and yet may be so ill that after leaving you he may hang himself on the tree nearest to your consulting room A depressed patient appears emotionally flat and dull, you cannot penetrate the blank wall which he presents to you Although he may talk, you feel you are not really understanding, and, conversely, what you tell him appears not to sink in

Physique and Nutrition.—When observing the patient in front of you, try to assess his general physical condition By looking carefully you may learn not only about his present nutrition but also something of the body he was born with and the imprint that time has made upon it.

First, estimate the patient's *weight*, and compare this with the expected weight for age With practice, it becomes almost an intuitive step, and certainly should not occupy the mind for more than a few moments

Then consider the *subcutaneous tissues*. If the patient has been fat for a long time the skin hangs in baggy folds with well-marked creases between them, swelling due to œdema, however, looks quite different—the skin is tense, sometimes shiny, and, although the hair follicles may be unduly obvious, the skin creases tend to be ironed out. A fat person who has lost weight looks just as you would expect, like someone whose

skin, as well as his clothes, are too large for him. The subcutaneous scars called *lineæ atrophicæ* provide evidence of stretching of the skin, if the scars are purple, the stretching has been recent, but with age they become pale.

Generalized *muscular wasting* is usually obvious; but you may be in doubt as to whether the patient was always poorly developed or has recently lost some of his muscle weight Flickering, or fibrillation of muscle-fibres when you touch them, testifies to recent wasting Common sense and a consideration of the patient's occupation will help you, puny biceps are less remarkable in a clerk than in a miner



Fig 1—Acromegaly

A patient's muscular development often bears witness to his occupation, and his *skeletal development* to his heredity, early nutrition, and the balance of his endocrine glands The well-built young man with big bones probably inherited these admirable characteristics from his forebears and was well fed as a child If, however, his size is disproportionate, his arms long, his hands heavy and coarse, his lower jaw massive, he may be a victim of over-activity of his anterior pituitary gland—an acromegalic (*Fig* 1) In the same way, smallness of stature is often inherited, but is sometimes due to malnutrition, either from a deficient intake of the right food or inability to utilize it Dwarfism with marked disproportion—very short arms and legs—is probably due to more specific diseases of bone and cartilage formation or endocrine disorders

Lastly, human beings tend to be built according to two main plans—these are the broad-chested, thick-set individuals, and

the narrow-chested, tall, thin individuals There are many between those two extremes, but since we may associate certain habits of mind and activity with each type of build, it is worth while noting if your patient is clearly one or the other Thus the broad-chested, thick-set man tends to be over-active, energetic, and an extrovert The tall, thin person tends to be a thinker rather than a doer In this, as in so many ways, the observation of structure may give you a clue as to function, and be invaluable in determining your attitude to the patient



Fig 2 —Parkinsonism

Bodily Activity.—Observe your patient's actions The droopy asthenic youth with hypotonic muscles, excessive curvature of the spine, and flat feet is heir to one set of ills, the plethoric, talkative young man to another Quick jerky movements, rapid speech, and behaviour may be a clue to thyrotoxicosis On the other hand, incoordinated movements, clumsiness, grimaces, and excessive fidgetiness, will make you think of chorea Poverty of movement, an expressionless face, and dragging feet are signs of Parkinsonism which you can also notice at once (*Fig 2*) Tremors, if fine and generalized, are usually due either to thyrotoxicosis or to an anxiety state, if coarse or localized, they are probably due to some organic neurological lesion You will notice the patient's gait, whether he is halt or lame but may defer detailed examination and tests until later, when you can consider the nervous system as a whole

There is much, therefore, which in your general survey you can learn about a patient's bodily activity

Peripheral Circulation.—Since the days of Galen and before, doctors have tried to learn from a study of complexions Though most of us no longer believe in sanguine or phlegmatic *humours*, the colour and texture of a patient's face are *important*, sometimes vital, clues in diagnosis

Where else should we first look for *pallor*, but in the face? Pallor may be due to a thick skin, or to constriction of the subcutaneous arterioles as a response to severe cold or toxæmia It may also be due to a small amount of blood travelling through the skin, as in traumatic shock, or to a low hæmoglobin concentration in the circulating blood—anæmia, in other words Having observed pallor, you must be very careful not to diagnose anæmia, anæmia can only be *predicted* after you have compared the stain made by a drop of the patient's blood on white blotting paper with standard colours or the stain made by a drop of normal blood, and anæmia can only be *diagnosed* by laboratory methods You are less likely to err in clinical judgement if you look at the buccal mucous membrane, the palate, the tongue, the palpebral conjunctivæ, or the palms of the hands, preferably all five The outward appearance of anæmia in infants is even more unreliable than in adults

A pink *flushed face* caused by dilated cutaneous arterioles may be found in emotional states, after exercise, or with raised metabolism or fever In fever, the flushed cheeks often throw into prominence the dead-white skin around the lips This circumoral pallor was at one time thought to be a diagnostic sign of scarlet fever, but it may occur in anyone with a pyrexia, particularly in the very young

The complexions of the old often bear the imprint of their past The thickened weather-beaten countenance of the sailor and farm-hand may, nevertheless, be difficult to distinguish from that of an alcoholic A peculiar bluish-red flush high on the cheek bones, associated with some blueness of the lips occurs extremely frequently in advanced mitral stenosis This is one of those curious empirical facts abounding in the study of medicine, and invaluable in practice, but for which no completely satisfactory explanation can yet be given Its companion is the fact that sufferers from aortic valvular disease are often pale

Cyanosis, meaning blueness, is an exact term Its presence suggests that the hæmoglobin of the blood beneath the area of skin observed has been reduced Local cyanosis of the face may mean nothing more than that the peripheral capillaries and venules are dilated due to cold, and that the blood stagnating in them has become blue If, however, the cyanosis or blueness is universal—if in fact, the lips mouth, and tongue are as blue as the most exposed parts, such as the ears, nose,

and cheeks—then you may infer either that more than a third of the total hæmoglobin of your patient is in the reduced form, or that there is some delay in return of blood from head to heart. Such an inference, if soundly drawn, is of immense value to you But *don't* say a patient is cyanosed just because he has dilated blue venules on his cheeks, or has an expensive alcoholic nose

The Hands—Surely the next thing you must do is to feel his pulse? This is both customary and convenient Thereby a bond is established between you, a hush falls upon the scene,

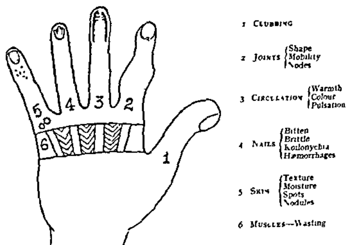


Fig 3 —What to learn from the hand

and you have unrivalled opportunities both for thought and careful observation of his hands A man's *hands* (*Fig* 3) are as informative as his face, and often more truthful than his tongue Consider one finger alone it is covered by about 5 sq in of skin, all of which you may observe, and it contains three joints, several tendons, one finger-nail, and the richest supply of blood vessels You therefore continue your study of the patient's circulation Are the fingers warm, what colour are they, do the finger-tips pulsate abnormally? Observe the colour of the nail bed and any capillary pulsation there Are there any petechial spots in the pulp of the finger or beneath the nail?

Next look at the structure of the fingers. Are they all of proportionate length, are the joints fully mobile, are they swollen or deformed, are there any swellings around the



Fig 4 —Rheumatoid arthritis

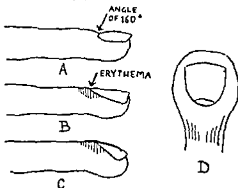


Fig 5 —Finger clubbing A, Normal finger tip, B, First stage of clubbing C, Second stage, D Third stage ('drumstick' fingers)

joints? (*Fig* 4) Look at the tips of the fingers, is there any finger clubbing? (*Figs* 5, 6) The earliest stage of *finger clubbing* which you will be able to recognize is a filling in of the normal depression between the terminal interphalangeal joint and the

root of the nail (*Fig* 5 B). Normally the nail springs from the finger in such a way as to leave an obtuse angle of about 160° between it and the slope of the dorsal surface of the finger



Fig 6 —Finger clubbing



Fig 7 —Spoon-shaped nails

(*Fig* 5 A) When there is early clubbing, this angle is flattened out into a straight line and there is glazing of the skin over the root of the nail In the more advanced stages of clubbing there is a gradual convex curve from the terminal joint right on to

the tip of the nail (*Fig* 5 c) In the most marked degrees of clubbing you will also find, when the hand is held up, that the tips of the fingers are expanded to look like drum- spores at the ends of tetanus ba…

Lastly … and (spoo… nail … koilonychia … you find evidence of severe … may help you in building up a picture of the patient's mental state· but remember it may be, like nicotine staining, just a manifestation of a habit The nails may also show evidence of a man's occupation

The Skin and Hair.—When looking at a patient's complexion and his hands you must, of course, pay attention to the skin itself, as thereby you will be able to learn something about the patient's metabolism For example, the skin of a thyrotoxic patient appears thin, shiny, warm, and moist, whereas the skin of a myxœdematous patient appears thick, coarse opaque, and dry *Pigmentation* of the face may be due to heredity

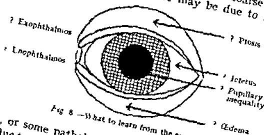


Fig 8 —What to learn from the eyes

sunburn, or some pathological cause Yellowness of the skin may be due to race, to fading sunburn, to drugs, or to jaundice You should notice a generalized rash or the presence of spots, if spots are present do they fade on pressure, or are they true petechial spots—that is, small hæmorrhages beneath the skin?

The hair, like the skin, is coarse and dry in myxœdema and also grows thinly When you see the hair growing out irregularly, so as to give a moth-eaten appearance it is as well to think of syphilis Deficient pubic and axillary hair or lack of facial hair in a man, suggests infantilism or destructive changes in the pituitary gland So *don't* forget to look at the hair as well as the skin

The Eyes.—You will probably have to look closely into the structure and functions of your patient's eyes if his chief disability is neurological, but you must also train yourself to notice many things during your first few minutes with him (*Fig* 8) Notice ptosis, prominence (*Fig* 9), or sinking in of the eyes, and notice œdema of the eyelids Look for signs of jaundice in the conjunctiva, squint, or abnormalities of eye movements Lastly, look at the pupils, their size and shape



Fig 9—Exophthalmos

The Tongue.—Examination of the tongue is essential in acute disease, but no less important in the diagnosis of chronic disease The tongue, which may show important neurological signs, is also said to be the mirror of the stomach Perhaps the most important aspect of examination of the tongue lies in the information you may obtain from it about the *hydration* of the body, about the *anæmias*, and about *toxæmia* Something will be said later on about the tongue in acute emergencies and about the tongue in digestive and neurological disease, but here are some guiding principles for its examination. The first rule is—never forget to look at it The second rule is—look at it carefully Look at the size of the tongue and see if it is in proportion to the face Is it wasted and wrinkled? Observe any tremors or weakness of tongue movements Consider the colour of the tongue, together with the colour of the inside of the cheeks, and try to make an estimate of the hæmoglobin concentration in the blood Look at the surface of the tongue is it dry or moist? A dry tongue, like the symptom of thirst, usually means dehydration and water depletion, but excessive panting talking, or breathing with the mouth open may cause a temporary dryness If the tongue is coated, note the colour

and distribution of the 'fur'. See if the tongue has the normal quota of papillæ which give it a rough appearance, or whether it is smooth and shiny due to loss of papillæ. Lastly, look for disease of the epithelium, for ulcers, fissures, or cancer.

When you realize that, by so examining the tongue, such widely different conditions as uræmia, dehydration, and secondary syphilis may all be tentatively diagnosed, perhaps you will learn to remember it and to make the patient put out his tongue as you finish your observations on his pulse and hands.

SECOND STAGE. UNDRESSING THE PATIENT

Throughout your hearing of the patient's history you will have been busy with your eyes and ears. You will also have felt the patient's pulse and asked him to put out his tongue. But you will not have made any attempt to examine him systematically. Before you do this you must try to make one more general survey of the patient, this time when he is undressed. Later, in a busy practice, you will not find it possible to examine every patient stripped, but by that time you will have gained sufficient medical insight to know which of many patients needs to be undressed. As a student you should examine all your patients undressed, except the acutely ill. This is a difficult thing to do if you yourself are shy about it. Don't be. Be clear and firm. Let them gather from your remarks that complete undressing is taken for granted. If the symptoms point to disease of the nervous system or locomotor system, it is probably best for the patient to leave on only a single upper garment, shirt or vest, in all other cases it is best for the patient to strip down to a pair of drawers. In the case of women try to have a nurse or female friend to help them. The old particularly need help and encouragement at this stage. If you examine your patient as a whole, stripped or nearly stripped, you will have an incomparable advantage over the doctor who tries to fumble for clues amidst a maze of undergarments. (These remarks apply chiefly to chronic disease, in acute emergencies it may be quite against the patient's interest to undress him completely, but we will return to this later.)

Once the patient is undressed, if he is an out-patient, try to examine him standing or walking while undressed. In this way you may notice all sorts of things—scoliosis, wasting of

muscles, shortening of limbs, asymmetry of the chest, for example—which might have escaped you had you tried to examine him piece by piece. If the patient is in bed, stand at the bottom of the bed and look at his body as a whole. Once you have examined a patient thoroughly, stripped, there will probably be no need for you to do so again during his illness. A limited field of observation will suffice for further examinations.

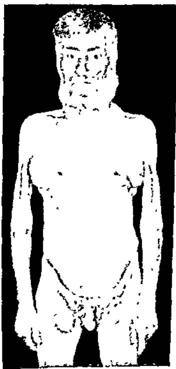


Fig 10.—Lymphatic leukæmia

The Lymphatic Glands and the Joints (*Fig* 10).—We ourselves have found it useful to examine the mobility of a patient, his joints, and his lymphatic glands at this early stage of examination. Others, no doubt, would do these things later. In defence of our system, we would say that unless you make these routine observations at the beginning, you tend to forget them at the end. So watch the patient's movements, examine his main joints carefully, if necessary flex the elbows and the knees to see if you can observe rheumatic nodules, but do this in a good light.

Next palpate the occipital region, both sides of the neck, the axillæ, the supratrochlear region, and the inguinal region for enlarged lymphatic glands. Remember that small bunches of inguinal glands occur in most normal people, and they may be quite numerous in a patient who has had repeated injuries or septic places on the legs or feet. Small soft glands in the posterior cervical region and axill[illegible] palpable, too, in normal people, especially chi[illegible] the diagnostic

significance of enlarged epitrochlear glands has been doubted, since these are also found in a proportion of normal people Where there is extensive skin disease or sepsis, you should expect to find a generalized lymphadenopathy, and the same

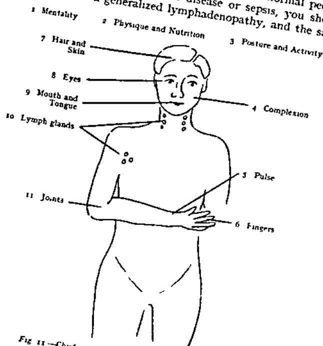


Fig 11 —Chief steps in the general physical examination

is true for many conditions in early childhood In an adult generalized glandular enlargement with a palpable spleen is always of significance Large, firm, hard or tender glands are naturally more likely to be important than small soft painless glands

SUMMARY

In the first few minutes try to sum up your patient—his mentality, nutrition, and bodily activity As you feel his pulse, study his complexion and the circulation in his fingertips

Notice any abnormality of the hands, the nails, the hair, or the skin.

Next look down the patient's face, paying particular attention to the eyes. Ask him to put out his tongue, and inspect it carefully.

If it has not been done already, your patient must undress almost completely When he has undressed, you can examine his bones, joints, and lymphatic glands (*Fig. 11*)

CHILDREN AND INFANTS

Possibly even more than in the examination of adults, the preliminary assessment of children is essential and must be cultivated. If, in your preliminary survey, you fail to observe that a child is seriously ill, perhaps even almost dying, you may never realize the fact until it is too late

Children differ in many ways from adults the child is *not* merely a miniature man If you expect to find exactly the *same manifestations of disease in the child, and, therefore,* attempt to examine him in the same way, you will in many cases be completely misled A few essential principles will help you in your approach to children

The outstanding difference between patients in the pædiatric age-group and others is simply expressed by the one word—'growth' the child is growing anatomically, physiologically, mentally, and morally To understand the disorders of childhood you must, therefore, know something about the harmony of normal growth The child's total personality is made up of characteristics which are in a state of flux, new features are constantly being added and old ones lost, and the relative proportions are always changing Children differ among themselves, just as adults do The 'normals' vary greatly, according to heredity, sex, diet, illness, and many other factors, but it is possible and important to assess the individual child Ask yourself 'how far?' has he already developed, and 'how fast?' is he still developing The first can be gauged by comparing his achievements with those of children of the same age, and the second by noting the rate of progress over a period of time Both methods are important You will find it helpful to know a number of average achievements, while not forgetting that it takes many variations to make an average

Weight—At birth 6½–7½ lb; doubled in 4–6 months, trebled in 1 year, quadrupled in 2 years; 33 lb. at 3 years, 49 lb at 7 years

Length—At birth 20 in; half as much again at 1 year, doubled at 4 years

Head—Circumference at birth 13½ in, increasing by 2 in in first 3 months and 1½ in in second 3 months, 18–18½ in at 1 year, 19–19½ in at 2 years Anterior fontanelle closure varies widely, but is usually complete by 15–18 months

Teeth—First tooth at 5–7 months, 4–6 teeth at 1 year, all 20 teeth of the first dentition by 2½ years The 'six year molars' are the first teeth of the second dentition to appear

At 3 months—Lifts head and shoulders for short periods, rolls onto back from side, moves limbs vigorously, follows movements and searches for source of sounds by moving his eyes, coos, plays with his fingers, holds small objects

At 6 months—Rolls from side to side when lying on back, draws knees up when lying face down, can sit with some support Reaches forward to grasp objects, and can pass them from hand to hand Turns head to familiar sounds, coos and chuckles, babbles to mother

At 1 year—Crawls well, can pull himself upright, may walk with support Can oppose finger and thumb, puts food (and other objects) in his mouth Obeys simple commands, says 2 or 3 meaningful words

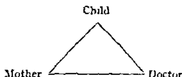
At 2 years—Runs, kicks a ball, walks up stairs, opens doors, takes an active part while being dressed Has vocabulary of some 20 words, puts 2 or 3 words together, indicates toilet needs

At 3 years—Runs confidently jumps, undoes buttons Is selective in feeding, is continent at night, knows his name and sex

The method of examining a child differs from that which you follow for adults For success you need to combine the qualities of *patience* and *opportunism*—the very qualities needed to make a good poker-player or a Dictator You will be unable, as a rule, to examine young children in an orderly sequence, and must learn to adapt yourself according to circumstances, yet without sacrificing thoroughness The doctor who "gets on well with children" does so by seeming able to imagine himself in the same position as the child, to feel as the

child does in the difficult situation of being examined, and by the understanding and sympathy which develop is enabled to put the child at its ease.

A young child is not an entity which can be isolated; in the problems which affect the child the mother is intimately concerned Your examination must, therefore, include the mother in its ambit, and to win confidence you must try to build up the 'pædiatric trinity', which may be expressed by a diagram -



Older Children.—Your best plan is to ignore the child at first, until it has become accustomed to your presence and your voice Adults expect and appreciate a direct approach, but a child feels insecure and frightened if a stranger intrudes by looking and speaking directly at him Let the child play with a toy while you talk to the mother In a short time you will have obtained the history, and then both you and the mother can unobtrusively join in her child's play The mother can now start to undress the child (or encourage an older child to undress itself) and you should not attempt to help All this time you are absorbing impressions, not only of the child but also of the mother and of their relationship, the one to the other

You will notice whether the child is unduly dependent on its mother for many childhood disorders arise from this cause Thus, an overdependent child may develop anorexia or enuresis when a new child is born into the family and its own security appears to it to be endangered On the other hand, a child may appear irresponsive and withdrawn if it is not receiving its due share of affection

A single glance will usually enable you to recognize a *mongol* (*Fig* 12), by its slanting eyes set in a small round head, and its cheerfulness associated with mental retardation, and you can often confirm the diagnosis by finding accompanying congenital defects such as a congenital heart lesion, and queerly shaped ears and fingers A *cretin* (*Fig* 13) may also be recognized at a glance, mentality metabolism, and development are all

retarded, so that the child is dull and backward, with a thickened, cold skin and scanty hair, and is slow in everything he does In both these conditions more complete examination may reveal nothing of diagnostic importance, the diagnosis is made on the first impression *Mental deficiency* can also be



Fig 12 —Mongolism [*Figs* 12, 13 *from Pædiatrics for Nurses* (*Watkins*), *by kind permission*]

recognized at a glance by the trained observer It is sometimes difficult to define, especially in the absence of such gross lesions as microcephaly, but may be characterized by a vacant look in the eyes, lack of attention and concentration, and sometimes by the presence of physical stigmata (such as poorly-developed ears, a high arched palate, etc). The diagnosis,



Fig 13 —Cretinism.

however, depends mainly on a history of marked slowness in passing the normal milestones

Physical defects such as spastic diplegia (*Fig* 14) are also quickly recognized at your preliminary inspection, which should, as we have suggested, include observation of the child at play, moving, and walking

Infants —Infants present even more distinct problems A baby can be within a few hours of death, yet the severity of the condition may pass unrecognized by those unaccustomed to dealing with infants The only satisfactory way of getting over this sort of difficulty is to see as many infants as possible, in their homes or in hospital, to inquire what is wrong with them and to find out what happens to them



Fig 14 —Spastic diplegia (Little s disease)

When you set about the examination of an infant, try to profit from the experience of your Chief In the first few months of life, when the child cannot sit up, you will find he is best examined lying on his mother s lap, after she has undressed him By the age of a year, when he has learnt to sit up well, the child may cry if you make him lie down, and it is then often necessary to carry out some part of your examination with the infant sitting up on the mother s lap

If you are fortunate enough to see the child when it is asleep, do not wake him— a considerable part of your examination can be carried out very well in this state For example you can observe the pulse-rate in young infants by palpating the

anterior fontanelle The rate of respiration may also be estimated and provides extremely valuable information, a rate higher than 60 in a minute is *very often due to pulmonary* infection, and is the more important because abnormal physical signs in the infant's chest may be difficult to elicit The heart may be briefly examined before the child starts to cry on waking up The abdomen may often be completely palpated if your hands are warm and gentle, in this way, during sleep, the sausage-shaped mass of an intussusception may sometimes be felt without recourse to an anæsthetic Even the optic fundi may be examined without waking the child

When the baby is awake deal gently with him still Sudden, violent movements are disturbing; instead, move and speak deliberately, and slide the hands or the stethoscope equally deliberately and gently from one part to another

General Assessment.—Train yourself, as for adults, to estimate the weight by the child's appearance, though an accurate weight is to be obtained whenever possible The state of *nutrition* is very important, learn to estimate it by comparison with other children, and learn to estimate it both by the appearance and by feel The feel of a wasted child is different from that of a healthy one The greatly wasted, marasmic child, is readily recognized, he is listless, shrivelled, with sunken eyes and grey appearance, and a depressed fontanelle and inelastic skin The less marked forms require more practice for their recognition

Dehydration presents a similar picture in the advanced stages —marasmus is only an end-result, which may be reached by various routes—but in the early stages, so important for treatment, it is best recognized by careful observation for dryness of the tongue and skin, loss of tension in the fontanelle, and diminution of urinary output

While you are making your general assessment, observe the infant's alertness and activity, both mental and physical

Scheme of Detailed Examination—It should be repeated that in the examination of infants and children, you may not be able to follow a set routine, but your examination must, nevertheless, be thorough

Look at the *face*, but beware of diagnosing anæmia merely because the face is pale Many normal young babies have a flat nose but after the first few months it may be due to syphilis

or achondroplasia A hare-lip is not to be missed, and the palate should be inspected later, when you come to view the throat

Note the size and shape of the *skull*; rickets (*Fig* 15), for example, is manifest and can be diagnosed earliest in the skull, at the age of 3 or 4 months soft areas can be indented by the



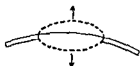
Fig 15 —Rickets Note bossed head rickety rosary on ribs and distended abdomen

examining finger The *anterior fontanelle* is a most important source of information, and must always be palpated in the examination of any infant The diagrams overleaf (*Fig* 16) illustrate the conditions which this examination will help

you to recognize—once you have excluded crying as a cause of bulging

Having dealt so far with the head, test for *neck rigidity*, but postpone inspecting the throat and ears until the end of your examination, because the ungrateful patient will resent your thoroughness violently and vociferously.

Now examine the *trunk* and *limbs* superficially, noting in particular any skin lesions, especially of the umbilicus, or superficial congenital anomalies Next examine the *heart* and *lungs*, remembering that percussion is not only of limited value



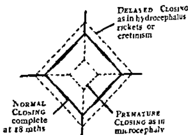


Fig 16 —The anterior fontanelle

in the infant or small child, but is also frightening for your patient Thorough palpation of the *abdomen* is followed by movement and palpation of the *limbs*

When your examination is otherwise complete, you must invariably end by examining the *mouth* and *throat* and both *tympanic membranes*, and, at some convenient moment, by collecting a sample of *urine* for examination You will recognize the experienced pædiatrician by the protective towel draped over his knees and the convenient receptacle modestly hidden under his chair

CHAPTER IV

THE CARDIOVASCULAR SYSTEM

On the surgery wall of a 'Shilling Doctor' in Glasgow ma years ago, a stethoscope was hung, above it a notice read "*Use of tubes, 2d extra*" Many morals can be drawn fro this probably apocryphal story, our point is that the diagnos of heart disease does not depend exclusively on the use of th stethoscope It is justifiable to go even further the diagnosi of heart disease is not by any means based exclusively o examination of the heart

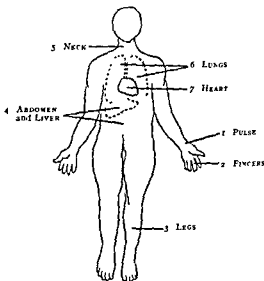
In any leisurely examination it is a sound rule to attend last to the organ probably at fault Consequently, in suspected heart disease, the heart should be left until the remainder of the body has been examined The most culpable though probably the most popular 'method', is to smack a stethoscope over one or two vague areas of the precordia and proceed at once to make a diagnosis This is unforgivable On the other hand even experts may have no fixed and logical order of examination even though it must make for simplicity and completeness to follow some orderly routine of examination

An attractively simple scheme is to conduct the examination of the cardiovascular system by following the direction of flow of the blood * This is an extremely helpful method of training yourself to examine not only the heart but the whole circulation really thoroughly and we propose to impress it on you by calling it **'the circulatory tour'**

Going with the blood-stream we suggest you start by examining the arteries radial and femoral and the blood-pressure, next, the capillaries and peripheral circulation, as seen in the face finger-nails and skin in general then the venous system including the neck veins and liver After that logically you come to the right side of the heart and examine the tricuspid and pulmonary valves still following the blood-stream,

* See East T *Cardiovascular Disease in General Practice*, 1946 2nd ed H K Lewis & Co Ltd

you next examine the lungs, then finally pass on to the mitral and aortic valves of the left side of the heart At the end of your examination you should have omitted nothing of importance in the cardiovascular system and your thoroughness will have carried you a long way to a complete diagnosis



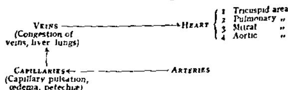


Fig 17 —The *circulatory tour* A scheme for orderly examination of the cardiovascular system

It is reasonable to alter the scheme slightly, by examining the lungs before the heart, in this way the heart is examined as one entity though still in the order suggested

The accompanying diagram (*Fig 17*) illustrates 'the circulatory tour It will be described in essential detail after

symptoms have been described, since that is the order in which you will, in practice, consider the patient

SYMPTOMS

It goes almost without saying that you should learn as much as possible from the patient's symptoms before starting your examination It would be desirable to consider symptoms, too, in the same logical order as already described for physical signs It is unfortunate, however, that they do not lend themselves to such precise marshalling, and for this reason we shall describe them instead, as far as possible, in the order in which they appear

Before proceeding to consider the symptoms of cardiovascular disease two warnings are necessary (1) Even in the presence of disease there may be *no* symptoms if an efficient circulation is being maintained. (2) If symptoms *are* present they may appear unconnected with the cardiovascular system, e g, faintness, due to cerebral anæmia, or dyspepsia, due to engorgement of the intestinal tract

1. *Dyspnœa* —Difficulty in breathing is a symptom not of any specific cardiac lesion but of some forms of heart failure The sequence of increasing deterioration is Shortness of breath with moderate exercise → with slight exercise → at rest → on lying down (orthopnœa) Dyspnœa develops because increasing distension of the pulmonary veins is accompanied by increasing rigidity of the lung tissue, with a resulting disturbance of the Hering-Breuer reflex

Dyspnœa is the commonest symptom of heart failure, but this must not be diagnosed without supporting evidence

In the natural history of mitral stenosis dyspnœa may occur very early long before other symptoms become evident On the other hand, in aortic regurgitation or hypertension it is usually a late symptom

In the late stages of cardiac failure other respiratory symptoms such as cough and hæmoptysis may occur but, apart from dyspnœa respiratory symptoms are generally due to respiratory disease and not to heart disease

2 *Palpitation* —This may be simply defined as consciousness of the beating of the heart In most cases it has nothing to do with heart disease the more the heart is felt, the less

abnormal is there to feel in it. In most instances the complaint of palpitation suggests nervousness, but it may be due to many other causes. Palpitation may sometimes occur with organic heart disease, as in advanced aortic regurgitation with an enlarged left ventricle. If it occurs in bouts, with a definite and sharp beginning and end, it suggests one of the paroxysmal tachycardias. Commoner than all these is the sensation of a 'missed beat', which is usually due to an extrasystole, but which is also referred to by the patient as a palpitation.

3 *Precordial Pain.*—The only well-recognized cardiac pain is due to ischæmia of the heart muscle; this is one of the occasions when anæmia really hurts. The local anæmia may be permanent (coronary thrombosis) or temporary (angina of effort), but in both cases the pain is characteristic in many ways. *Type.* Gripping, aching, or pressing. *Severity.* Mild to agonizing. *Variation.* There is no fluctuation, though it may slowly wax or wane. *Site.* Usually beginning under the middle or upper part of the sternum, though occasionally under the lower sternum or in the epigastrium. *Spread* (if severe). Usually to left arm, less often to the neck, occasionally to the jaw or abdomen.

These features are common to cardiac ischæmia, but as the diagnosis is an ominous one you must be most meticulous in eliciting all the features of the pain, to enable you to distinguish it from less ominous pains such as those of neurosis, pleurisy, or 'indigestion'.

4 *Gastro-intestinal Symptoms.*—Cardiac failure may lead to congestion of the abdominal viscera, with the production of anorexia, nausea, a sense of fullness, pain over the liver (more marked with effort), and occasional vomiting. Without more definite evidence these are of only imprecise diagnostic value.

5 *Cerebral Symptoms.*—Mental confusion, due to cerebral anoxia, may be the first symptom of heart failure. It is worth remembering this, and examining your patients carefully in the casualty department before packing them off to the asylum. Symptoms such as headache, dizziness, and fainting can also occur with heart disease, but they are more commonly due to emotional disturbances.

6 *Malnutrition.*—When the degree of cardiac failure becomes marked the patient may waste or fail to thrive, often,

however, even gross wasting is masked by the simultaneous occurrence of œdema Severe congenital heart lesions, with or without cyanosis, frequently cause thinness and sometimes stunted growth

PHYSICAL EXAMINATION

THE CIRCULATORY TOUR

It is easier to go with the stream than against it, and some of the energy you save can be used to observe the vegetation and landmarks on the banks As we have already emphasized, it is logical to start your examination at the pulse, to proceed by assessing the capillary and then the venous circulation, and to end up at the heart By this orderly procedure nothing of importance is likely to be omitted, and you can train yourself to look, *en route*, for additional clues such as cyanosis, nodules, clubbing, petechiæ, œdema, rheumatic rashes, and thyroid enlargement

The Pulse.—

How to feel—It is essential to feel with the sensitive tips of the fingers Customarily it is taught that three fingers are placed on the patient's radial artery, but two are sufficient for nearly every purpose

What are you feeling for?—Know *consciously* what you are feeling for, or your examination will degenerate into a gesture with no significance

1 Gauge the *vessel* you are feeling, i e, its calibre and the condition of its wall

2 Gauge the factors dependent on the *heart*, i e, the rate and the rhythm

3 Gauge the factors dependent on *both*, i e, the volume of the pulse-wave and the form and shape of the wave You may also, with more practice, estimate the blood-pressure at the height of the beat (systolic pressure) and between beats (diastolic pressure)

The Artery Wall—You may feel undue hardness or sinuosity of the artery wall as in arteriosclerosis If in doubt compare with the feel of your own radial artery palpated with your free hand placed on your examining hand, but if you are in doubt the artery is likely to be normal The normal artery, rolled under your first and second fingers, seems to merge into the surrounding soft tissues This feature tends to be lost in

middle age, and in old age the artery feels like a hard cord under the fingers; but beware of any diagnosis made on this finding alone. At the same time as you are feeling for hardness and sinuosity you will be able to form some idea of the comparative elasticity of the artery wall.

Rate.—The average adult rate is 72 in a minute, but it varies from individual to individual, and with posture and many other factors In the newborn the rate is almost twice as fast as, and in old age is slower than, in the prime of life. If there is any marked divergence repeat your count after a few minutes, when such factors as excitement will have abated. In doubt, or with any unusual figure, compare the pulse-rate with the heart-rate; in this way you may detect dropped beats, for example

Rhythm.—The commonest irregularity in *children* is sinus arrhythmia, in which the rate increases with inspiration and decreases with expiration Getting the patient to take slow, deep breaths markedly accentuates this irregularity; any cause leading to a rapid pulse-rate tends to abolish it In *adults* the commonest irregularity is caused by extrasystoles, which may give rise to a missed beat or a beat earlier than expected at the wrist With extrasystoles the irregularity tends to be only occasional, with auricular fibrillation, on the contrary, it is an uninterrupted or irregular irregularity. To distinguish between these two conditions try the effect of exercise on the rhythm, with rapid rates of beating extrasystoles disappear but auricular fibrillation becomes more evident But, whatever you suspect, make no final decision about abnormal rhythms until you have examined the heart itself

Volume.—With your two fingers practice repeatedly to distinguish between the normal, moderately full pulse of health, the bounding pulse of fever, and the thin, thready pulse of shock

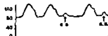
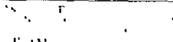
Form and Shape.—With even a little experience you can recognize the different forms of pulse. The common type is the regular 'up-and-down' wave of the normal subject

Another type is the very steep wave which occurs in conditions where there is a considerable difference between the systolic and diastolic blood-pressure (as in aortic regurgitation or thyrotoxicosis) Such a pulse which flicks momentarily against the examining fingers, is known as a 'Corrigan'

or 'water-hammer' pulse It is misleading to call it a 'collapsing' pulse, as is often done, because the characteristic flick which is felt is produced by abnormally rapid filling of the artery, and the rate of emptying or 'collapse' is less marked and less easily recognized The flick of the pulse against the finger is much more easily felt if the patient's wrist is held up while you palpate, the position is that which is taken if you tell the patient to keep his elbow on the table while holding the hand as high as possible

At the opposite extreme from the Corrigan pulse is the uncommon 'anacrotic' pulse, observed characteristically in aortic stenosis, in which the pulse-wave falls and rises very gradually

TYPES OF PULSE

EXTRASYSTOLES Note the 'regular irregularity'	
AURICULAR FIBRILLATION Note 'irregular irregularity', with variation in depth and frequency of beats	
CORRIGAN PULSE Note the excessive pulse-pressure, and the steep ascent which produces the characteristic 'flick' against the finger	
	

With any unusual pulse form, and particularly if the pulse-wave appears flat, train yourself to pass on automatically to palpating *both* radial pulses at the same time and in the same position In this way you may get an early clue to unilateral pressure on some part of the arterial tree, for instance, by an aneurysm pressing on a subclavian artery

Blood-pressure —With only a little practice you can gain for yourself a reputation as a 'human sphygmomanometer Feel the pulse, first with light, then firm, pressure A pulse which can be

felt best with light pressure suggests a low blood-pressure, a pulse felt best with firm pressure suggests a high blood-pressure

Sphygmomanometry.—Measuring the blood-pressure with a mercury manometer (*not* the capricious aneroid type, unless it is standardized every few months) is an essential part of any examination of the cardiovascular system Nevertheless, it is only too easy to be 'blinded by science'; the sight of a delicate mercury column and precise figures marked on the instrument may very easily lead you to attach quite a fictitious importance to minute deviations, and to regard the instrument as an infallible index instead of merely one weapon in your armamentarium Remember that even the 'normal' figures are not sharply definable; thus, for life insurance purposes the common practice in England is to take 160 mm Hg as the maximal systolic pressure, while in the U S A. 145 mm is the maximum With the following precautions, and bearing clearly in mind the fallacy of any rigid adherence to set figures, blood-pressure estimations can, however, help you considerably

First, wrap the armlet round the upper arm. Then make sure that both the patient and his arm are comfortably relaxed *Feel the radial pulse, as a preliminary, and read the pressure* level at which it can no longer be felt It is important to carry out this preliminary reading as a guide to the more accurate auscultatory method, which you now proceed to Feel with your fingers for the brachial artery in the cubital fossa, and place your stethoscope over it Now you are ready, but the patient still is not The excitement of this applied science will produce an abnormal reading, so distract his attention for a little while to give it time to abate Now inflate the armlet rapidly, while you listen over the brachial artery When the sound disappears continue to inflate the armlet for a time; if you stop at that point you will frequently obtain fallacious readings Now let the air in the armlet escape slowly, and listen carefully The *systolic* pressure is taken as that point at which the sound first becomes audible again Deflation is continued, and the sound becomes louder, suddenly it is replaced by a weak sound, soon to disappear The *diastolic* pressure is taken as the point where this sudden replacement occurs If no sudden change occurs the diastolic pressure cannot be accurately determined, but the point at which all sounds disappear should be recorded

A single determination may be extremely misleading Always determine the pressure at least twice, with an interval between the readings during which you put the patient at his ease

Other Arteries —The radial artery has been very conveniently placed by a beneficent Nature having due regard both for convenience and modesty. Nevertheless, there are other arteries with a palpable pulse which are of importance in clinical examination The *femoral* artery should be palpated in all cases, but especially with suspected congenital heart disease or high blood-pressure in children, if you cannot feel



Fig 18 —Linear hæmorrhages beneath nail

it consider seriously the possibility of coarctation of the aorta The *tibial* arteries, palpable just anterior and posterior to the internal malleolus, should be felt for in patients of middle or advanced age with symptoms referable to the legs, such as intermittent claudication or diabetic gangrene The *retinal* arteries are the only arteries which may actually be inspected, and in hypertension in particular you should always examine the optic fundi

"*Vegetation on the Banks*" —When you have examined the pulse (and what has taken considerable time to read about will take up only a little time in actual practice) you must not pass on before you "pause to observe the vegetation and landmarks on the banks" If you do not look at the fingers now you probably never will Examine them for *clubbing* and for *abnormalities of the nails*, such as the spoon-shaped nails of microcytic anæmias Look also for *petechiæ*, and for the *linear hæmorrhages* (*Fig* 18) under the nails seen in bacterial

endocarditis. In suspected acute rheumatism and in chorea look very carefully for *nodules* over the wrists, backs of the fingers elbows, and ankles (*Fig* 19) If present, these nodules are



A



B

Fig 19 —Rheumatic nodules A at elbow B at ankle

an almost infallible sign of active rheumatic infection They are much better seen than felt, if the skin over the joints is put on the stretch they can readily be seen in a good light, and the skin is freely movable over them

The Capillaries —The important *direct* observation is that of *capillary pulsation* Elicit this sign by pressure on the finger-nail

sufficient, but only just sufficient, to cause blanching If the blanched area becomes alternately red then blanched again with each heart-beat, the test is positive Another way of detecting capillary pulsation is to press a glass slide against your patient's lip until blanching is produced Do not fall into the elementary error of attributing pulsation of the capillaries to excessive pulsation of the aorta The capillary pulsation test is positive in any condition where there is excessive vasodilatation, as in hyperthyroidism for example. But it is most marked where the pulse pressure (the difference between systolic and diastolic pressure) is also high, and is thus best seen with aortic regurgitation


Fig 20 —Œdema.

The most obvious *indirect* effect of capillary dysfunction is *œdema*, due to stasis in the peripheral circulation Œdema is late in appearing in the natural history of heart failure It should be sought in the dependent parts of the body, where the fluid accumulates because of the force of gravity (*Fig* 20) In the ambulant patient, look and test for it (pressure over a bone, maintained for several seconds, produces 'pitting') round the ankles, in a bed-ridden patient examine the sacral area, which is the most dependent part

Veins —Bear clearly in your mind that *zero level* for the venous system is at the right auricle Above this level veins should normally be partially collapsed, below it, more or less filled Consider the upper edge of the manubrium sterni as indicating the position of the auricles, distension of any vein

above the level of the manubrium sterni indicates abnormal filling of that vein This distension may be due to local pressure, but if it is bilateral, and if it pulsates markedly, it can safely be attributed to heart failure. (There is one important proviso. do not be deceived by the effects of a tight collar.)

Venous engorgement is most easily seen in the neck, where the jugular veins are readily observed (*Fig* 21) Whatever



Fig 21 —Venous engorgement

the position of the patient, jugular distension above the level of the manubrium sterni is significant In the upright position it is never normal, in severe cardiac failure the distension may even reach up as far as the angle of the jaw

The point about pulsation, in addition to engorgement, is important In contradistinction to cardiac failure, the engorgement due to mediastinal obstruction (by tumours, etc) is not accompanied by pulsation

At the same time as you look for venous engorgement in the neck examine also the thyroid, because *thyrotoxicosis* is a common cause of cardiac disease in the middle-aged While examining the neck look also at the lips and face, and try to come to a definite decision about the presence or absence of *cyanosis* look at the *inside* of the lips, because there cyanosis cannot be produced by cold, and is probably due to a central (cardiac or pulmonary) cause

Portal and Pulmonary Circulations.—*Ascites* and *liver enlargement* may occur in advanced cardiac failure, and œdema of the lung bases may also occur. They are fully discussed on pp 102, 106, and you might turn to read these sections now, before proceeding to the section on the heart Examination of the liver, for example, is so important in cardiovascular disease because the hepatic veins empty almost directly into the right auricle, and increased venous pressure quickly results in enlargement of the liver Such a congested liver may be very tender, and the abdominal muscles over it take up a protective rigidity, so that the blunt liver edge is very difficult to feel Armed with this knowledge, you will suspect congestion of the liver whenever you find tenderness of the right hypochondrium in a cardiac case

THE HEART

Now at last you come to the examination of the heart, but your tour of the circulatory system will by no means have been wasted

Failure of the heart to pump blood adequately is manifest chiefly at the periphery, by distension of veins and œdema For this reason it is advisable to commence your examination by a survey of the periphery, by so doing you preserve an integrated view of the whole circulatory system, and you have started to answer the fundamental question "What can the heart do?"

In the same way when you examine the heart itself remember clearly that it is one single muscular organ, what matters most is the state of this muscle, and only secondarily that of the valves The division of the precordia into 'mitral', 'aortic', and other areas is no more than a temporary convenience What you should aim at is to build in your mind a working model of the heart you are assessing

The Apex Beat.—*The most important single physical sign in the chest is the position of the apex beat* Use it as the foundation stone on which to build your model, then go on to the usual four methods of examination—inspection, palpation per-cu

al



Fig. 22 —Palpation of cardiac impulse

The apex beat is that part of the impulse which is farthest down and out, yet is still strong enough to be felt distinctly by the palpating finger But before you turn to defining it so precisely, get all the other information you can from it First, place the *palm* of your hand over the area where you see the impulse (*Fig* 22) Now note its general character, it may be forceful and heaving, as in left ventricular hypertrophy, or slapping, as in right ventricular enlargement, or it may give the impression of being double At the same time, generally with a lighter touch, you may feel a thrill in this area Now, but only now, change to the more precise method of localizing with your forefinger (*Fig* 23)

In a healthy adult, whether standing up or lying down, the cardiac impulse is usually in the 5th intercostal space, 3 to 4 in from the midline, i e , just within the midclavicular line In infants and in children, because the heart is relatively larger than in adults and because the belly seems a more important region and takes up more space, the maximal impulse is more usually in the 4th space and very often reaches the mid-clavicular line

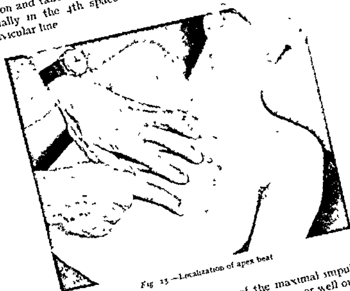


Fig 23 —Localization of apex beat

In an adult if the outer border of the maximal impulse is clearly 4½ in or more to the left of the midline, or well outside the midclavicular line it denotes a pathological condition, in one of two groups The cause may lie *outside the heart* (1) The heart may be pulled over e g , by collapse of the lung on the same side , (2) The heart may be pushed over, e g , by pleural effusion of pneumothorax on the opposite side, or more rarely (3) The heart may be displaced by malformation of the chest wall Alternatively, the cause may lie *in the heart* (1) If the apex beat is displaced both downward and outward, enlargement of the left ventricle is often present, as with disease of

rare exceptions You may miss a thrill through having cold hands, through not feeling very gently with the whole hand and above all through not positioning the patient correctly. For apical thrills turn the patient into the left lateral position; for basal thrills sit the patient up, get him to lean well forward, and if necessary get him to hold his breath in expiration while in this position You may mistake a forceful or widely split heart-sound for a thrill, but not if you remember that a thrill

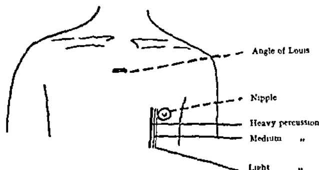


Fig 25 —Percussion of cardiac dullness, illustrating apparent variation in position of apex according to strength of percussion

is definitely sustained in time It is rather like the sensation produced when the hand is placed on the back of a purring cat *You can try to time the thrill*, but the murmur of which it is part is more easily timed through your stethoscope

3 *Percussion* —There are three useful rules about percussion of the heart —

- Use *medium* percussion because this gives the most

4 *Auscultation* —At long last you are going to use your stethoscope—but still not to listen for murmurs They must still wait They are, after all, adventitia, and you must first listen to the heart-sounds themselves In the same way, when auscultating the lungs you must listen first to the breath-sounds, and only afterwards for adventitious sounds

The Stethoscope —Your stethoscope should be a personal instrument, carefully chosen to suit you and carefully looked

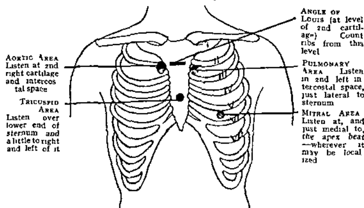


Fig 26 —Sites for auscultation

after A borrowed one is often unsatisfactory The ear pieces should fit tightly but comfortably, they, and the chest-piece, should be replaced if they are chipped or broken The tubing should be firm and intact and, to minimize losses in sound transmission, should be short (10–12 *in*) and of narrow bore ($\frac{1}{8}$ in) It is helpful to have two chest pieces a bell, with a sharp edge, with which you can best hear low frequencies, e g , the murmur of mitral stenosis, and a rigid diaphragm which cuts out low frequencies and enables you to hear high frequencies more easily, e g , aortic diastolic murmurs and splitting of heart sounds

Where to listen (*Fig* 26) —Listen precisely over the correct place, not somewhere near it In particular, you may miss the diastolic murmur of mitral stenosis if you do not listen exactly over, and just medial to the apex beat which you have

previously located and remembered so carefully So listen at the *exact* site for the appropriate valve sounds, for mitral sounds at and just medial to the apex beat, even when it shifts as you move the patient, and for the other valves at the sites marked in the diagram

What to listen for.—Here is an invaluable rule First listen *to* the sounds, then listen *between* the sounds

1 *Listening to the sounds* The normal lub-dup may sound distant This is usually due to causes *outside* the heart, e g, obesity or emphysema, but it may be due to causes *in* the heart, such as myocardial infarction or severe carditis, and is then of comparatively sudden onset in an acutely ill patient

The sounds may all be unusually loud, seeming to come *through your stethoscope with a violent thud If all* are equally exaggerated the cause is usually extracardiac Nervous overaction of the heart is by far the commonest underlying factor

It is more significant if only *one* sound is accentuated, and in that case you may well find some cardiac cause for the alteration Before you even consider the possibilities, however, go over the normals in your mind The first sound is normally louder than the second at the apex, and the second louder than the first at the base of the heart In children the pulmonary sounds are louder than the aortic, and the second pulmonary sound slightly 'split', in old age the aortic become the louder of the two, while in adult life they are approximately equal *Having learnt these, you can then recognize genuine* abnormalities The first sound at the apex may be accentuated, as with cardiac hypertrophy or mitral stenosis A sharply accentuated 'slapping' first sound should be taken as a warning to listen particularly carefully for the diastolic murmur of mitral stenosis The second sound at the pulmonary area tends to sound loud and sharp with any cause of congestion in the pulmonary veins, such as occurs in mitral stenosis or in congenital heart disease with a left-to-right shunt In auricular septal defect the second sound is *often widely split With hypertension or* aortic atheroma the second aortic sound assumes a sharp, exaggerated tone

Instead of two heart-sounds you may hear three The *third heart-sound,* which occurs quickly after the normal second sound and is heard as a short thud, is rarely important It may be

heard with careful listening in perhaps a third of normal children Its frequency grows less with advancing age, so that over 40 years of age it is practically never heard in normal hearts. A third sound which fits in with this description can be considered as normal Not so another type of extra sound The triple cadence known as '*gallop rhythm*' is not uncommon in failing hearts, with hypertension for example, where there is no evidence of valvular disease This ominous rhythm is best heard at the apex when the heart is beating at about 100 beats a minute The extra sound is of intensity almost equal to that of the other two, and it usually occurs a little before the normal first sound An 'opening snap' is a sharp, high-pitched sound which follows the second heart sound in mitral stenosis and is heard best in the fourth left interspace close to the sternum, it is heard because the normally inaudible vibrations associated with opening of the valve are accentuated

Listening still *to* the sounds, you may detect an irregularity in rhythm or in force In that event put your hand on the pulse and feel it at the same time as you listen to the heart In this way you will recognize 'dropped beats' They represent ventricular contractions which are too weak to propagate a pulse-wave

2 *Listening between the sounds—murmurs (see below)*

Murmurs

Before you read this section stop for a moment to ponder Do you realize that this chapter on cardiovascular disease is almost completed—that you should already be in a position to determine a good many important facts, and make some accurate diagnoses, even though murmurs have been almost entirely ignored? Murmurs are by no means the be-all and end-all of cardiac examination, they are important but are no more than a part of the evidence on which to assess the cardiovascular system and the patient

Train yourself, once you have listened to the heart-sounds, to shut them out from your perception so that you can concentrate on the intervals between them With conscious attention to this point you will find yourself listening intently from the end of one sound to the beginning of the next The importance

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Train yourself, once you have listened to the heart sounds, to shut them out from your perception so that you can concentrate on the intervals between them With conscious attention to this point you will find yourself listening intently from the end of one sound to the beginning of the next The importance

of this training lies not only in the comparative ease with which it will enable you to pick up murmurs, but also in the confidence with which you can satisfy yourself that there is *no* murmur present

Some General Rules for Listening to Murmurs.—

1. *Listen exactly over the correct site for the individual murmur*

2 Listen in the logical sequence suggested in 'the circulatory tour', then listen down the sternum.

3 Listen consciously *to* the heart-sounds, then *between* the heart-sounds

4. When you hear a murmur, proceed first to time it, i e, ask yourself whether it occurs in systole or diastole To help, feel the apex beat with your finger at the same time as you are listening The heave of the apex times the beginning of systole, *and should leave you in no doubt*

Another good way to determine systole and diastole is to listen carefully at the base of the heart, where the thudding first sound and sharp second sound are easily distinguishable The stethoscope is then moved slowly to the part of the precordia *where the murmur is best heard, without losing the* sequence of the sounds.

5 Next, note where the murmur is loudest, by following it in various directions

6 At the same time you will have observed the direction of transmission, if any

7 The character of the murmur will also have impressed itself by now You should be able to say whether it is harsh or soft, of high or low pitch, blowing or rumbling or squeaking In general, in trying to find an apt description of what you hear, use simple adjectives Such phrases as 'the shriek of a hungry sea-gull' or 'a borborygmous murmur' are misplaced.

8. Observe what happens to the murmur when you alter the patient's position or after exercise (re-read the important suggestions at the beginning of this section)

9 Keep in mind the physiological principles you have for so long laboured to acquire *Fig* 27 illustrates schematically how they form the basis of your understanding of cardiac murmurs Only the quality of the sound could not be deduced by you from physiological principles, and that is added empirically as the result of observation of cases in practice

These features are co-ordinated in the accompanying diagram (*Fig* 28)

	Normally open in	Therefore Stenosis produces Murmur in	Normally closed in	Therefore Regurgitation produces Murmur in
Mitral Valve	Diastole	Diastole	Systole	Systole
Aortic Valve	Systole	Systole	Diastole	Diastole

Blowing sound. Rough sound Very rough, or rumbling sound.

Fig 27 —The production of murmurs

Characters of Murmurs —Now you have gone over the necessary business of determining murmurs it is profitable to consider them individually and, as individuals, to learn to know their idiosyncrasies

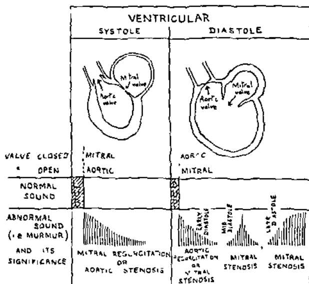


Fig 28 —The relationships of heart sounds (The left side alone is shown)

At the different sites murmurs have different characteristi
Just as you can learn to recognize a dog by its bark, so y
will learn to *confirm your timing of a murmur by its characte*
Sooner or later you will be able to reverse the order you w
automatically recognize a murmur by its character, and tir
it only for confirmation, but it will need a little experien
before you can trust your ear sufficiently for that.

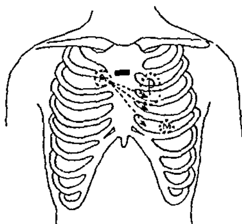


Fig 29 —Diastolic murmurs Areas of audibility and direction of conduction A, Aortic, P, Pulmonary, M, Mitral

1 DIASTOLIC MURMURS (*Fig* 29) —Diastolic murmurs are always pathological—how rarely such emphasis is possible in medicine!

Tricuspid —Leave the diagnosis of tricuspid lesions to expert cardiologists, with the assurance that you will be none the worse a doctor for so doing

Pulmonary —Beware at once of a common mistake A diastolic murmur heard at or below the pulmonary area may be due to an aortic lesion If, then, you hear such a murmur in this region try to follow it across the sternum, *if you can hear* it also at the aortic area it probably originates there Diastolic murmurs heard along the left sternal border are common in various types of congenital heart disease, especially those in which there is a left-to-right shunt, these murmurs are often

soft and variable The 'machinery' murmur of patent ductus arteriosus is best heard at the pulmonary area It waxes and wanes in intensity, becoming louder through systole and softer in diastole (the diagnosis of patent ductus arteriosus will have been suggested if a water-hammer pulse has been felt, especially in a child)

Mitral—Diastolic murmurs in the mitral area are characteristically rumbling and low in pitch The pitch is often so much lower than that of other murmurs, almost approaching the point where it can be felt rather than heard, that it may be missed unless you deliberately listen at this auditory level The murmur may occur anywhere in diastole, but if it is truly pre-systolic (i e, in the short interval immediately preceding the first sound) it seems to be crescendo in character and ends in a first sound which is sharp and slapping Note again, in difficult cases the necessity for listening for a mitral diastolic murmur with the patient in the left lateral position, in the few beats just after exercise and exactly over or just within the area of the maximal impulse to which it may be exclusively confined

Aortic—A diastolic murmur at the aortic area is missed by students and by doctors more often than any other cardiac murmur The reasons are many, and understandable It is described as a blowing murmur, but is often extremely distant and faint It may be missed because of the noisiness of the breath-sounds in this region, or because it is heard at its loudest with the patient upright To make sure of hearing such a murmur, therefore, listen while the patient leans well forward in the upright position and if necessary holds his breath in expiration while maintaining this position

2 Systolic Murmurs (*Fig* 30)—Considered alone, a systolic murmur is of limited significance Considered together with other evidence it is often of help, but the diagnosis of an organic lesion based solely on a systolic murmur is open to many errors

In diagnosing organic disease, with regurgitation through a valve or a congenital defect it is helpful to remember that regurgitant murmurs are pan-systolic, the murmur starting with the first sound and finishing with the second

Tricuspid—Systolic murmurs in the tricuspid area are of no practical significance

Pulmonary.—In the pulmonary area, either alone or as part of a *widespread murmur* at the base of the heart, *systolic* murmurs are heard in a large number of normal subjects. They tend then to be soft and blowing in character, and to vary with position, respiration, and exercise If, however, the murmur is loud and rough, and if it is accompanied by a thrill and the second pulmonary sound is soft the diagnosis of pulmonary stenosis is probable The rough systolic murmur of ventricular

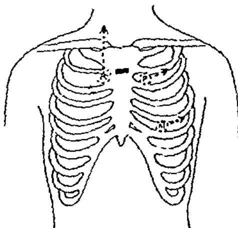


Fig 30 —Systolic murmurs Area of audibility and direction of conduction *A* Aortic, *P*, Pulmonary, *M* Mitral

septal defect is usually loudest lower down and is followed by a thudding second pulmonary sound The systolic murmur of auricular septal defect is not so loud or rough and may not be associated with a thrill, but the second pulmonary sound is usually widely split A systolic murmur may be the most audible part of the 'machinery' murmur of patent ductus arteriosus, already described (*see* p 55)

Mitral —Systolic m... at the m... have given
rise to more contro... ny othe... wn to medi-
cine Though they ... ot indi... nic lesion,
this does not help ... dividua... out other
evidence they are b... a ba... gnosis of
cardiac lesions Si... rtin... uld be

enlargement of the heart, or the onset of the murmur in acute rheumatism where no murmur was previously audible. If the murmur is harsh and is propagated far out into the axilla an organic basis becomes more probable. It is safest to consider a mitral systolic murmur as a warning—a warning to intensify your search for the truly diagnostic diastolic murmur. In the long run you will do much less harm by ignoring all apical systolic murmurs than by making your patient worry about his heart while you solve what is often an academic problem (see table, below)

SYSTOLIC MURMURS IN THE MITRAL AREA

May be due to	*Possess these Characteristics as a Rule*
Unknown causes, cardiorespiratory murmurs	Often soft or squeaking in character. Maximal in pulmonary area, or parasternal, but often widespread. Vary with position. Vary with phases of respiration
Rapid circulation, as in excitement, fever, anæmia thyrotoxicosis	Soft and usually widespread. Do not vary greatly with position or respiration
Enlarged left ventricle, causing relative mitral incompetence	Soft or moderate blowing murmur. Maximal in mitral area. Not varying with respiration
Organic disease of mitral valve as in acute rheumatism or sequel of bacterial endocarditis	Soft to loud blowing murmur. Maximal in mitral area. Made louder with patient in left lateral position. Not affected by phase of respiration

Aortic.—A soft aortic systolic murmur is nearly always unimportant, and is certainly common in healthy subjects. Even harshness is an unreliable guide, and should be no more than a warning to examine *for* a thrill. A systolic aortic murmur may be heard when the heart is beating fast, and sometimes when it is slow, even in healthy subjects, in the presence of anæmia atheroma of the aortic valves, aneurysm, or aortic stenosis. It should be accompanied by a thrill for the diagnosis of stenosis to be reliable, a diagnosis which you will already have

considered when you found a 'flat' anacrotic pulse at the beginning of your tour

The accompanying table summarizes the important facts about the significance of systolic murmurs heard in the mitral area. Work out for yourself a similar one for aortic systolic murmurs

3 OTHER MURMURS —

Congenital Heart Disease —The systolic murmurs of congenital heart disease are often rough, and accompanied by a thrill They are commonly heard at the base of the heart or along the sternum, especially its left border. Diastolic murmurs are not uncommon in congenital heart disease, especially with a left-to-right shunt, and are usually heard at the pulmonary area or along the left sternal border They are usually soft, and their intensity may vary from time to time.

Before a diagnosis of congenital heart disease is made, *supporting evidence should be carefully sought Evidence in the* heart may be. enlargement (especially of the right ventricle, [illegible]

abnormalities of the pulses, e g, water-hammer pulse in patent ductus arteriosus, or absent femoral pulses in coarctation of the aorta

Remember that congenital heart disease may remain symptomless even into adult life.

Pericarditis —Pericardial friction sounds may cause confusion with valvular murmurs Loud pericardial friction resembles the leathery grating of pleural friction and is easily recognized The less obvious sounds may be extremely soft, and the student who hears them without being shown may be proud of his achievement *They may be confined to a very* [illegible]

the friction sounds correspond exactly in time with the sounds of the heart-beat Often the murmur caused by pericarditis is extremely superficial, sounding almost like an echo, and it may vary according to the pressure you exert with your stethoscope If friction sounds are heard to vary with the phases of respiration they are called 'pleuro-pericardial', and are then

commonly due to inflammation of that part of the pleura which is in contact with the pericardium

Exercise Tolerance Test —You will by now have most of the data on which to build your medical working model, but you need one more item of information—you want to know how the patient's heart works under stress If the heart is already beating fast, or if the patient is breathless after undressing or at rest, additional testing is obviously unnecessary, the heart has very little in reserve, and it would be dangerous to put it under an increased strain In fact, the patient's history will often give more information than any test you can devise, and no test can be relied on to separate mental from physical limitations to exercise For these reasons exercise tolerance tests are frequently omitted, but the use of the same test with all your patients will often give you some help A simple one is to get your patient to place one foot on a chair, then raise himself on it to the upright position twenty times in one minute Count his pulse, and observe the depth of respiration, when he is standing quietly at rest before starting to exercise, and again immediately after the test and after an interval of one minute Do not draw any conclusions until you have carried this out on normal subjects of different ages and made a 'norm' for yourself

SUMMARY

1 Obtain a complete history

2 Look at the patient as a whole

3 Carry out 'the circulatory tour' Start by examining the arteries then proceed to the capillaries, the veins, and finally end with the heart

4 During this process of 'going with the stream', look for additional evidence such as clubbing, petechiæ, œdema, liver enlargement lung engorgement, cyanosis (central or peripheral) and thyroid enlargement

5 The heart should be examined last, in the orderly manner suggested, using the four methods of inspection, palpation, percussion, and auscultation and their four applications

6 Try to summarize your data by asking yourself the following questions —

a Is there evidence of organic heart disease?

b. If there is, is it acquired or congenital?

c If acquired, is it active or quiescent?

d. If congenital, is there evidence of a shunt, and if so is it from left-to-right or from right-to-left?

7 Your ultimate object is to ascertain what the heart can do To do this try to build up in your mind a working model of the cardiovascular system by using not one but every possible item of information

CHAPTER V

THE RESPIRATORY SYSTEM

"CHESTS are so difficult" How often does one hear this complaint from students! It is true that the diagnosis of chest disease may derive from the history alone or from radiography, but physical examination is none the less important There are many facts which can only be known after you have used your eyes, your hands and your stethoscope upon the chest

FIRST PRINCIPLES

While examining a patient's chest, try to bear two pictures in your mind at the same time—one is a still picture of the underlying lung, its gross anatomy and finer structure, and the other is a moving picture of the mechanism by which the physical signs you seek to elicit are produced

Wherever your eye or your hand or your stethoscope rests, picture beneath that spot the bronchi vessels alveoli, and pleuræ Whenever you elicit a physical sign, try to understand just how that physical sign is produced By thinking thus in terms of anatomy and physics you can often build up a picture of any pathological process within the chest

Remember that chest examination at first is difficult and that the art is not easy to acquire, so until you are really familiar with what normal chests look like feel like, and sound like, hesitate to attach any importance to isolated abnormal physical signs

SYMPTOMS

In the diagnosis of respiratory disease few things are so important as a knowledge of the patient's normal environment and work his past illnesses and his general health So many chest diseases begin with general symptoms such as loss of appetite and weight sweating, malaise and lassitude So many chest diseases have their roots in a past illness or an industrial hazard Your history of the patient must be very full and

precise about dates of onset. Luckily, local chest symptoms are relatively few and easy to interpret You should, therefore, in every case inquire whether the patient suffers or does not suffer from one or other of the three primary chest symptoms —pain, cough, or breathlessness If *pain* is present, make the usual ten inquiries about the pain (*see* p. 6). If *cough* is present, find out whether it is dry or productive of sputum The daily amount and character of the sputum must be discussed with the patient. Hæmoptysis, the spitting of blood, may mean either a slight staining or streaking of the sputum or the product of a severe pulmonary hæmorrhage. You must try to find out which sort the patient means, and whether the blood came from the mouth, the pharynx, or the lungs *Breathlessness* should be considered against a background of the patient's normal activities, sleeping, walking, or running—and you should try to find out exactly when and where it affects him

BREATHING

Respiratory Behaviour.—Breathing is a process which, has long been regarded as synonymous with life itself There is much to learn by watching it Emotion, organic brain disease, and abnormalities of the blood, of metabolism, of excretion, of the circulation, or of the lungs themselves, may all interfere with normal respiration

First, notice whether your patient's breathing is easy, so that he is not consciously aware of doing it Uncomfortable, laboured breathing—*dyspnœa*—may merely mean that the patient has, for deep-seated emotional reasons, become aware of the normal subconscious movements of respiration and, by a conscious effort to breathe, is actively interfering with the mechanism Such dyspnœa is most obvious when the patient's attention is directed to it and is absent during sleep On the other hand dyspnœa may mean very serious organic disease But, whether dyspnœa is present or not, count the respiratory rate, estimate the depth of breathing, and watch for irregularities or variations in its rate and depth over a short space of time (such as Cheyne-Stokes breathing) Dyspnœa, if it is marked, will bring the 'accessory muscles' of respiration, the scaleni, sternomastoid, and nasal muscles into play The latter cause the wings of the nose (alæ nasi) to expand with inspiration, a

movement which provides valuable objective evidence of respiratory distress. Again, severe dyspnœa will usually cause your patient to sit upright (*orthopnœa*), particularly if the dyspnœa happens to be of cardiac origin.

Inspiratory Dyspnœa.—This is the name given to painful breathing due to obstruction to the inflow of air into the lungs, as by a narrowing of the laryngeal inlet. Its characteristics are prolonged difficult inspiration, accompanied by sucking in towards the mediastinum of the soft tissues of the neck, and of the intercostal spaces and ribs, particularly the 6th, 7th, 8th, and 9th, between the anterior axillary line and the sternum.

Expiratory Dyspnœa.—This is either due to bronchial spasm or inflammation, or due to loss of contractibility in the lung tissues, so that expiration, normally almost a passive process, becomes an active muscular effort. Its characteristics are prolonged difficult expiration, but with contraction of the accessory muscles during inspiration.

Interruptions to Breathing.—Notice whether the patient's inspiration is suddenly checked by a pain so that he grunts, or coughs, or moves at the same phase of each respiration. This phenomenon is due to disease either of the pleuræ or overlying muscles.

Adventitious Sounds.—While watching your patient breathe, you must also keep your ears open. You may hear a sighing or crowing noise at each inspiration—*stridor*—which indicates some obstruction high up in the respiratory tract, or you may hear wheezy noises arising deeper in the chest. If these occur both in inspiration and expiration, they are more likely to indicate some organic obstruction in a main bronchus. If these occur *only* in expiration they are probably caused by bronchial spasm or mucus in the smaller bronchi.

Voice.—Hoarseness and loss of voice are usually due to organic or functional disease of the larynx but may be due especially in children, to secretions from the nasopharynx obstructing the movements of the vocal cords.

Grunting.—Patients whose breathing is rapid and shallow often grunt at the start of expiration. This usually indicates painful respiration as in pneumonia or acute inflammation of the pleura.

Cough.—It is useful to be able to know by its sound whether a cough is due to irritation of the pharynx or to mucus in the

bronchi, whether it is due to disease of the larynx or the pleura Though it is difficult to reach this ideal, there is a good deal to learn from the character of the cough A dry, hacking cough, repeated every few minutes, is usually due to inflammation or secretion in the pharynx; in children with enlarged tonsils this type of cough may sound thicker. A harsh cough is often associated with a hoarse voice, and suggests laryngitis. If the vocal cords are paralysed the cough becomes brassy or bovine Pleural pain may produce a dry sharp cough, which characteristically occurs at the same phase of each respiration, and is very distressing to the patient. Cough due to secretions in the chest irritating the sensitive spots at the bifurcation of the bronchi is often paroxysmal and moist The cough starts explosively, sounds dry at first, but with each successive volley becomes moister, until a blob of mucus is cast up into the pharynx and the patient is relieved If a patient has advanced bronchiectasis, a sudden movement or a cough may fling some of the mucus from the insensitive dilated bronchi on to undamaged sensitive mucosa, so that a veritable storm of moist coughing ensues, and ends only when the patient has coughed up a large quantity of sputum It is a poor prospect when a patient cannot laugh without this happening to him If the patient's respirations are weak, then there is no force behind the cough, secretion accumulates, and the cough becomes very moist. The loud churchyard cough is a habit, the purpose of which, like violent histrionic belching, is to attract attention The two are often heard together in out-patient clinics but, like the 'green-sickness', they are fast disappearing from the medical scene

INSPECTION

During the earlier stages of your examination you will have been absorbed in watching the patient's respiratory behaviour and keeping your eyes and your ears open for any clues Next you should proceed to make a more systematic inspection of his chest It is all-important for you to obtain a *good view of the chest*, so do not hesitate to ask the patient to strip right down to the waist Later in the examination, if the weather is cold, you can arrange to cover those parts of the chest which are not actually being examined, but don't deny yourself the first good look at the chest as a whole *With an out-patient* it

is convenient to inspect the chest of the patient standing and let him turn round so that you can see the back When the patient is in bed let him lie down flat while you stand at the foot of the bed If the light is good you will then be able to make out the general shape of the chest, asymmetry may be obvious, and you can see the pattern of the ribs clearly For instance, from that vantage point you might see quite clearly that the muscles over the left apex were wasted and the ribs crowded together in that region, whereas had you looked from close by you would have been beset by doubt. You might see obvious flattening of one side of the chest You might see a slight, but none the less definite, bulging of the intercostal spaces all down one side, if this was on the right side and you could, at the same time, see the apex beat displaced to the left of its normal position, you would be in the enviable position of being able to make a diagnosis of right pleural effusion or pneumothorax, without having laid a hand upon the patient This sort of opportunity occurs quite frequently The importance of inspection of the chest cannot be over-rated

See *what sort of chest* your patient has is it symmetrical and flattened anteroposteriorly as it should be, or is it blown out into a barrel-shaped cylinder as happens with the all-too-common emphysema of advancing age? Such a chest is bounded by widely-separated ribs, which, instead of sloping downwards, tend to run forward in the transverse plane

Next, *watch the chest movements* deliberately does the chest expansion look full, or is it restricted? Particularly watch for any inequality of movement between the two sides If you think there might be, tell the patient to take deep breaths and watch again, try to make up your mind there and then You are more likely to find the answer by the use of your eyes than you are by palpation or other means, so don't put off your decision We stress the importance of this observation, because so much can be deduced from observing diminished movement on one or other side After all, if there is diminished movement and you are certain of it, it must mean disease on that side, or chiefly on that side This knowledge will be a guide to you throughout the rest of the examination Other observations, perhaps difficult of interpretation, will then have to be made to tally with the undoubted fact that one side is the diseased or the more diseased side of the chest

PALPATION AND INSPECTION COMBINED

It is not right to insist upon a rigid plan of examination which, in the first place, involves difficulty and labour for patient and examiner, and which anyway will probably later be abandoned by the student. Thus it is wasteful to make your bed-patient sit up more than once in the course of a chest examination. Provided that you have not skimped the first good long look at your patient's naked chest from the foot of the bed, you should then proceed to palpate the chest, watching as you go

First, satisfy yourself about *three priorities—finger clubbing,* the *apex beat,* and the *trachea* Pick up your patient's hand and look at the fingers for evidence of clubbing This should become an automatic action as you approach a patient's chest

Secondly, if inspection has not helped you to do this, determine the *position of the apex beat* by palpation. The site of maximum intensity of the cardiac impulse should be sought for first by laying the palm of the right hand across the left anterior chest After estimating the position of the apex beat in this way, proceed to localize it exactly with a finger-tip, then both measure the distance from the mid-sternal line *and* estimate *its position in relation to the midclavicular line* Because of the wide variations in chest shapes it is always as well to have two cross-bearings on this most important point The position of the apex beat is vital to the diagnosis of respiratory as well as cardiovascular disease, so make no mistake about it But two words of warning if the heart is dilated or diseased, the *apex beat should be localized at the farthest point from the* mid-sternal line at which a cardiac impulse can be felt distinctly If the apex beat is difficult to feel, owing to a thick chest wall or underlying emphysema, try getting the patient to expire and hold his breath for a few seconds, as this will often enable you to feel the beat

Thirdly, determine the *position of the trachea* Here again, you should use two or more methods to try for a sure answer Look to see if the clavicular insertion of one sternomastoid is more obvious than the other, as it is when the trachea is deviated to that side Next run the tip of your right index finger up and down the front of the trachea from the cricoid cartilage to the sternal notch, to appreciate the general trend

of the trachea. Next, try inserting your finger down between the trachea and the sternomastoid insertion on each side. If it slips in easily on one side but not on the other, then the trachea is deviated away from the side into which your finger slips easily. Be gentle.

Firm pressure on the sternum during expiration may cause an audible wheeze in patients who are asthmatic, and this test is well worth trying in all cases of chronic cough and dyspnœa.

The next step in a routine chest examination is to look at the *nose, mouth, and throat*. This doesn't mean a complicated examination—just inspection of the shape of the nose, of the interior of the mouth, and of the fauces. With a good light, a tongue depressor may not be necessary, but if it is, take care not to place its blade too far back on the tongue where it will irritate a sensitive area which makes the patient 'gag'. If the patient has false teeth, make him remove them before the examination. After looking at the throat, palpate both sides of the neck for enlarged glands or other abnormality.

Next, lay your hands on the front of the chest, one below each clavicle, to check on the movements of the apices. When you have done this, get the patient to say "one, one, one" or "ninety-nine". Then move the hands lower down, so as to grasp the chest between the axillæ and nipples, and repeat the manœuvre.

Tactile Fremitus.—A word must here be said about this item of examination. The voice sets up vibrations in the alveoli of the chest which are normally conducted outwards to the chest wall and are there palpable. There are great variations in the degree of conduction and palpability of these vibrations in normal chests, and you must not attach importance to minor variations. The method is more useful in certain circumstances than in others. Though a child's chest conducts vocal vibrations well, the high-pitched female voice is not deep enough to make easily palpable vibrations come through the thicker chest wall. Thus, tactile fremitus in adult females is often very difficult to elicit and consequently of doubtful value. You should ask your patient to say in a deep voice "one, one, one" rather than "ninety-nine", because the *former words can be pitched deeper and "come through the chest"* more easily. Do not be misled by minor variations in tactile fremitus, and remember that the only real alteration

which matters is their absence or marked decrease in a certain area of the chest This occurs most markedly with pleural effusions, pneumothorax, and pleural thickening (which cut the path of the vibrations from the lung to the chest wall), and it is in the diagnosis of these conditions that the elicitation of tactile fremitus is of most value Apart from this, tactile fremitus plays only a very minor role in chest examinations, so do not lose your sense of proportion about it because it seems to be a novel method.

You have now finished with the front of the patient's chest as far as inspection and palpation are concerned, and later you

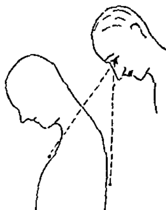


Fig 31 —Inspection of apices from above

must sit him up and look at the back Look for swellings, œdema, curvature of the spine, or asymmetry, and carefully watch the chest movements Stand over the patient while he is sitting up and look down on the apices of his lungs from above (*Fig* 31) First, you should note the relative height of the two shoulders and then you should look down the front of the chest below the clavicles, in this way you may detect minor degrees of muscle wasting over or flattening of an apex Next *look down the back in order to see the posterior* curve of the ribs, collapse of a lung or part of a lung from any cause leads to a flattening of that backward convexity Test the expansion

of the lower parts of the lungs by the method shown in *Fig.* 32. Test the tactile fremitus Its significant absence will be found more easily at the back than at the front, and you should attach more importance to its elicitation there



Fig 32 —Expansion of lung bases Index finger placed firmly along intercostal space, thumbs vertical. Observe movement of the two thumbs away from the midline on deep inspiration

PERCUSSION

Percussion can be done in more than one way Sometimes it is a good plan gently to slap the back and front of the chest with the volar surfaces of the fingers By doing this, grosser abnormalities in the percussion note will be obvious at once

To map out the areas of percussion dullness accurately and to elicit slight changes in note it is best to use the left middle finger as a plessor and the right middle finger as a percussor

But percussion must be done carefully and according to cert rules, if you use this more indirect but more accurate meth (*Fig* 33) First, the plessor finger must be laid flush with chest and not allowed to arch itself, it should lie in the int costal spaces if percussing up and down, or firmly across line of the ribs if percussing across the chest The percuss finger should strike the plessor finger on the dorsal surface its middle phalanx twice in quick succession and then be lif clear The percussing finger must strike vertically and action of the percussing hand must be wristy and sure Y should practise in order to gain flexibility of your wrist P cuss the furniture at home, your muscles, your bones, and yo

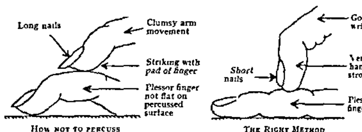


Fig 33 —The wrong and the right way to percuss

friends There is no short cut towards learning the art of pe cussion, practice is essential A word of advice we would offe particularly to women students don't try to percuss with lon finger-nails, for if you do so, you will either hurt the plesso finger with the nail of the percussing finger, or, to avoid pain you will start percussing with the volar surface of your finger pad, and so lose the inestimable value of a vertical hamme stroke

Study and think about the noises you hear, and listen to the variations in note which can be obtained simply by bending the plessor finger over a fixed spot Learn the variations in percussion note to be expected over a normal chest, over an infantile chest, a senile emphysematous chest, and a chest covered by a thick layer of muscle and fat Percuss chests in full inspiration and in full expiration, percuss between the ribs and across the ribs When you know all the possible varia-tions in note to be expected normally, you can begin to

develop a technique designed to detect abnormal alterations (*Fig* 34)

Probably the best method is first to tap the clavicles, then, starting about 2in from the sternal border, to percuss the plessor finger lying in each anterior intercostal space from above downwards, first on the right side and then on the left side When you reach the liver dullness on the right, percuss across the ribs in the right axilla and towards the right border of the heart, then percuss down the left side to the stomach resonance and then from the left axilla across to the left border of the

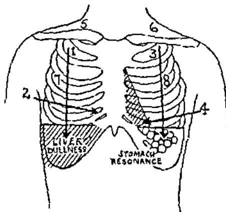


Fig 34 —The order of percussion

heart Next, by percussing lightly, compare the note over the upper intercostal spaces on the two sides Slight variations in percussion note are difficult to elicit and percussion must be light if you are to hear them This is most important where percussion of the lung apices is concerned, since gross tuberculosis disease in these regions may give rise to only slight impairments of percussion note At the back you should percuss with a firmer stroke and go right down to the hepatic or splenic dullness at the bases It is usually not worth while percussing directly over the scapula as the thick layer of muscle and bone interferes with the note too much Normal lung resonance may be impaired or it may be lost completely Complete

loss of lung resonance is usually known as 'stony dullness'. The note is flat and high pitched, as it is over the liver, and there is a lack of vibration in the underlying structures which the plessor finger can sometimes detect more easily than the ear.

Increased or boxy lung resonance is found when percussing emphysematous lungs, and an extremely drum-like note is obtained over a pneumothorax. It may be said, in fact, that the note obtained by percussion over the lungs depends on the relative quantities of air and fluid beneath the percussing finger The dullest note is obtained over a pleural effusion, a less dull note over a consolidated or collapsed lung, a normally resonant note over normal lung, a hyper-resonant note over a ballooned emphysematous lung, and a drum-like note over a pneumothorax

AUSCULTATION

Yet again, we must stress the importance of knowing the normal Before trying to listen to your patients' chests, listen to those of your friends, and always take the opportunity of examining and listening to the chests of patients suffering from disease of other parts of the body You will find that the normal respiratory murmur is often difficult to hear, is easily lost in extraneous noises and varies according to the part of the chest where you place your stethoscope (*see Fig* 36) If you settle the ear-pieces of your stethoscope snugly into your ears, if you yourself are comfortable and unhurried, and if you try to visualize as you listen what is happening to the air within the lungs, the sounds you hear will become clear both to the senses and the mind Some find it a help in the earliest stage of their apprenticeship to close their eyes as they listen, the better to conjure up a picture of what is going on in the lung beneath It is a pity, however, to make a permanent habit of this, since one of the most valuable features of the binaural stethoscope is the opportunity which it gives to the wearer of watching the movements of any part of the chest at the same time as he is listening to the air entering the lung beneath

Certain conceptions are fundamental, if the sounds heard are to be understood

a The normal vesicular breath-sound is a compound noise produced by the entry of air into myriads of tiny alveoli It is a low rustling sound which reaches a peak of intensity towards the end of inspiration and then dies away in a short low

expiratory hum, there is no pause between the inspiratory and expiratory sounds This type of sound is heard best over normal expansile lung tissue, for example, in the axillary region or posteriorly below the inferior angle of the scapula

b **The tracheal or bronchial breath-sound** is a relatively simple or pure noise produced by air rushing up and down those hollow cylinders and being deflected by the larynx and the carinæ at bronchial divisions It is comparable to the noise you can make by blowing down any hollow tube which is partially obstructed Try making in-and-out strokes of the plunger of a bicycle pump to which the flexible connexion has been attached, or breathing in and out through the mouth with

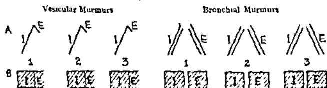


Fig 35 —A, B, Diagrammatic representations of respiratory murmurs (The first is that most commonly used) I, Inspiration, E, Expiration, 1, 2, 3, Respiratory cycles

the lips forming the consonant K, and you will hear two very passable imitations of bronchial breathing Better still, to hear the natural sound at its loudest, listen with a stethoscope over the trachea or over the spine of the 6th cervical vertebra It is a hollow, rushing noise, heard equally throughout inspiration and expiration, but only very faintly in the intervals between these phases of respiration (*Fig* 35) Any condition which leads to alveolar consolidation (as in pneumonia) or collapse, but which leaves the bronchi patent, will cause bronchial breathing to be heard in that area

c **The normal respiratory murmur** (*Fig* 36) is a mixture between vesicular and bronchial components, but the vesicular noise is so much more obvious that the bronchial sounds are obscured, except directly over the trachea or large superficial bronchi Bronchial sounds are also damped down by the static sound-insulating effect of patent alveoli At the right apex, beneath the clavicle, the bronchial sounds from the nearby trachea and upper lobe bronchus may be so loud that the resulting murmur is bronchovesicular in quality. By the same

token the exact quality of the respiratory murmur varies somewhat over different areas of a normal chest, because of the proximity or otherwise of large bronchi In infants the murmur is bronchovesicular in *all* areas

d. The intensity or volume of the breath-sounds depends on: (1) the amount of air entering the underlying lung (2) the thickness of the chest wall; and (3) the presence of a sufficient number of alveoli to cause the rustling noise Breath-sounds

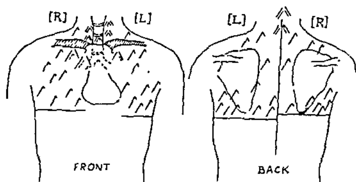


Fig 36—The normal distributions of bronchial and vesicular murmurs

may, therefore (1) be abolished by bronchial occlusion (2) diminished by pleural thickening or fat, or (3) diminished due to emphysematous or fibrotic destruction of the normal alveolar pattern (*Fig* 37)

ALTERATIONS IN BREATH-SOUNDS

CONDITION OF BRONCHUS	CONDITION OF ALVEOLI	BREATH-SOUNDS
Collapsed	Collapsed	Absent
Patent	Collapsed [or consolidated]	Bronchial
Patent	Patent	Vesicular

As with chest movements, a most significant finding is inequality of the respiratory murmur on the two sides.

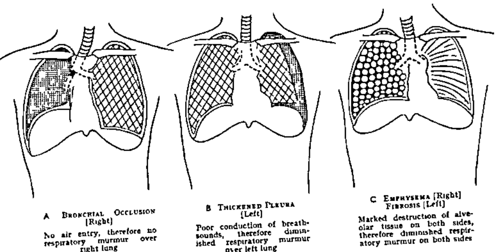
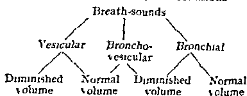


Fig 37 —Some causes of diminished respiratory murmur

VARIATIONS IN RESPIRATORY MURMURS



Adventitious Sounds.—The exact mechanism by which adventitious or added sounds are produced in the chest is not known for certain, but we do know that the sounds may come from inside or outside the lung (*Fig* 38) *Extrapulmonary* sounds are produced either by the creaking of thoracic muscles or by the friction of pleural surfaces rubbing together Muscle creaks are inconstant leathery sounds which vary with the patient's position Pleural friction sounds are superficial, discontinuous, rubbing sounds, heard equally on inspiration and expiration The sounds are often crescendo on inspiration and diminuendo on expiration

Intrapulmonary sounds are probably produced by the flow of air over secretions in the bronchial tree, and they may be divided into 'bubbles' and 'squeaks' 'Bubbles' known either as *râles* or *crepitations*, according to the whim of the nominator, are discontinuous moist sounds probably caused by air in the bronchioles bubbling through secretions These sounds may be fine, medium, or coarse 'Squeaks', known as *rhonchi* if they are sonorous and *sibili* if really squeaky are probably due to the vibrations of strings of mucus or other obstructions across the lumen of the larger bronchi

The basic classification and conception of adventitious pulmonary sounds are summarized in *Fig* 38

In describing the adventitious sounds you should always try to place the sounds in one of the categories shown in the rather rigid classifications of *Fig* 38 After doing that, you may use your power ... ession and k ... of the English language t ... r descripti ... ample, "medium râles hea ... ea beneath ... avicle anteriorly; these we ... musical ...

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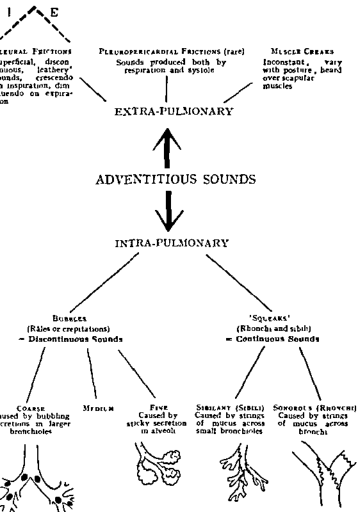


Fig 38 —Adventitious sounds.

listen carefully and long enough. The distinction between localized and generalized adventitious sounds is vitally important in diagnosis

Secondly, if you hear adventitious sounds in a certain localized area, do your best to make them disappear. Make the patient cough and take deep breaths and then listen again Inconstant adventitia dispersed by coughing are of much less significance than those which remain despite all attempts to shift them.

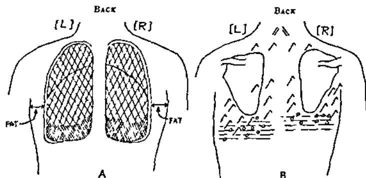


Fig 39 —The fat bedridden lady A, The lungs, the shaded area being œdematous B, The physical signs, round circles indicate medium *rales, the shaded area percussion dullness*

Lastly, make certain that the adventitia you hear are really what you think and not due to the sliding of the bell of your stethoscope over a sticky or sweaty skin (this produces sounds like fine râles), or to the borborygmi from a windy stomach or colon

Let us now illustrate some of these conceptions by examples

a A fat, thick-chested woman of 60, bedridden, with poor chest expansion but no gross respiratory disease (*Fig* 39)

Breath-sounds will be vesicular except over the trachea and right apex, and will be very faint, particularly at the lung bases posteriorly Due to the accumulation of secretion in the bronchioles at the lowest part of the chest, medium crepitations will be heard at the bases, but these will disappear after coughing or over-breathing

b. A wasted man of 55 with collapse of the left lower lobe due to carcinomatous obstruction of the lower lobe bronchus (*Fig* 40)

[illegible]

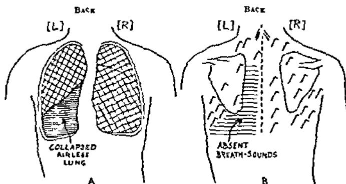


Fig 40 — Complete collapse of left lower lobe A, The lungs. B, Physical signs, the shaded area represents percussion dullness.

breath-sounds will be diminished over the lung tissue close to this area (due to compensatory emphysema developing there and so reducing the total number of alveoli contributing to the vesicular murmur)

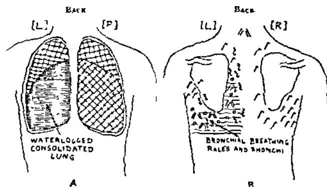


Fig 41 — Partial obstruction of left lower lobe bronchus A The lungs B The physical signs, the shaded area indicates percussion dullness the short wavy lines denote rhonchi.

c. As (b), but with only partial obstruction and inflammatory consolidation of lung tissue distal to the growth (*Fig* 41)

Breath-sounds will be diminished over the surface markings of the left lower lobe; they will be bronchial in character because, the alveoli being all shut, the vesicular murmur will be abolished and the bronchial sounds conducted straight through to the chest wall. There will be a low sonorous rhonchus produced by the partial bronchial obstruction, and

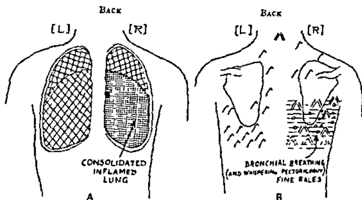


Fig 42 —Lobar pneumonia of right lower lobe A, The lungs B, The physical signs, the shaded area represents percussion dullness

probably showers of medium or coarse râles due to retained secretion in the bronchioles being disturbed by the entering air

d A young man of 25 with early lobar pneumonia of right lower lobe (*Fig* 42)

Breath-sounds will be vesicular in all normal places, but diminished over the right lower lobe Fine crepitations may be heard over this same area due to sticky alveolar exudate being disturbed by entering air A pleural friction rub (a series of superficial discontinuous sounds heard *crescendo* in inspiration and after a pause *diminuendo* in expiration) may be heard over the same area

e A girl of 15 with an early right pleural effusion (*Fig* 43) *This is big enough to collapse the basal segments of the lower lobe completely, but the bronchus to the dorsal segment of the lobe remains patent*

Due to the complete closure of the basal bronchi, breath-sounds will be absent up to about the level of the angle of the scapular posteriorly. Above this they will be heard faintly

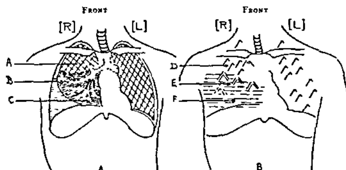


Fig 43 —Right pleural effusion A, The lungs B, The physical signs, the shaded area indicates percussion dullness.

A, Expansile lung, B, Compressed lung, patent bronchus, C, Compressed lung, collapsed bronchi, D, Vesicular murmur, E, Bronchial murmur, F, Absent murmur

but will be bronchial in character due to the collapse of the alveoli but patency of the bronchus Fine or medium râles

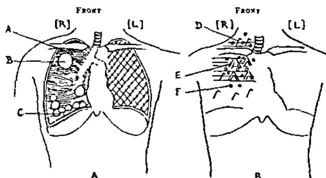


Fig 44 —Tuberculosis of right upper lobe A The lungs B The physical signs the shaded area represents percussion dullness

A Fibrosed and consolidated lung, B Cavity, C Emphysema, D Weak respiratory murmur E Bronchial murmur (cavernous type), F, Medium râles (tinkling quality)

may also be heard in this area due to the partial opening of sticky alveoli

f A woman of 21 with caseating and cavitating tuberculosis of the right upper lobe (*Fig. 44*)

Breath-sounds will be moderately diminished all over the affected area due to loss of alveolar tissue. If a bronchus passes over the surface, bronchial breathing will be heard clearly in that area because there are few alveoli present to drown the bronchial murmur with their rustlings If a cavity is close to the surface the bronchial breathing will have a very hollow cavernous quality due to the cavity acting as a sounding box Medium râles will be heard, particularly in the region of a cavity, and will be most marked after a cough has thrust the secretions into the deformed bronchi Such medium râles will be tinkling and musical in quality owing to their good conduction through consolidated tissue to the chest wall and the stethoscope.

Auscultation of the chest is an art which must be learnt; we cannot really describe to you what you hear. But be certain that you know the normal before you suspect the abnormal, and obey the rules of examination laid down for your guidance We summarize them now —

1 Note the intensity of the breath-sounds in all areas.

2 Note the character of the breath-sounds, bronchial or vesicular

3 Note adventitious sounds

4 Classify the adventitious sounds according to whether they are continuous or discontinuous, dry or moist, superficial or distant

Vocal Resonance.—Examination of the chest would not seem complete without observing the time-honoured ritual of 'ninety-nine' Do it by all means, obey the rules certainly, but may we just stress what we think are the two great uses of vocal resonance, so that you can carry out the experiment with intelligent anticipation rather than a dumb acceptance of routine?

1 *The confirmation of the presence of bronchial breathing* If you think you hear bronchial breathing ask your patient to whisper 'ninety-nine' and listen over the area you suspect Since the essential feature of bronchial breathing is a loud

sound cavernous too

2. *The detection of a thin layer of fluid in the pleura.* We don't know why you should, but if you have ever listened to someone's voice while your head is under water you will know that the sound is altered in character The fluid has eliminated certain overtones. Sometimes, when there is a thin layer of fluid separating the two layers of the pleura, the voice sounds will be conducted across this fluid, but are so altered in passage that they sound nasal to the listener with the stethoscope (ægophony) This sort of bleating or nasal sound can be imitated by saying 'ninety-nine' while pinching your own nose Ægophony, then, is a special physical finding which may occur in the course of the development of pleural effusions or at the upper level of larger ones Once heard it can usually be easily recognized thereafter It is important because it may enable you to diagnose a pleural effusion or empyema when other physical signs which depend on the accumulation of larger quantities of fluid (stony percussion dullness) or the collapse of the underlying lung (absent breath-sounds) have not yet developed Ægophony is not properly understood, but for all practical purposes if you hear ægophony over the lower zones of the lung, fluid is present there

THE SPUTUM

Patients with a dry cough, but anxious to please, often tender their saliva to the doctor who really wants to examine their sputum You should be able to recognize such watery specimens for what they are, and not waste time in examining them From bedside observations, there are three important things to know about a patient's sputum

First, you want to know the *daily quantity* of sputum produced Second you want to know whether the sputum contains *pus*, and if so how much Third, you want to know whether the sputum contains *blood* and if so, how much We hope you can recognize pus when you see it Smell it If it is offensive it probably comes from a necrotic area of lung tissue infected

purulent sputum is produced by those with pneumonia; such a sputum is composed of altered blood and pus, and should be examined microscopically for organisms A smear of sputum on a slide taken at the height of an acute pulmonary infection is always of value, even if there must be some delay before the smear can be stained and examined

SUMMARY

Observe the patient's respiratory behaviour, noting depth

foot of the bed, do this most thoroughly Then approach the patient, look to see if his fingers are clubbed, determine the position of the apex beat and the trachea Inspect the inside of the mouth and throat, palpating the neck and supraclavicular fossæ at the same time

Systematically palpate both sides of the chest with the left and right hands simultaneously, noting inequalities of movement, the presence of palpable thrills or rubs, or the decrease of tactile fremitus

Percuss the chest carefully, making sure to use exactly the right technique

Listen to the respiratory murmur in all areas, noting intensity and character of breath-sounds, and the presence of adventitious noises, then listen to the vocal resonance

Then sit the patient up and make the same series of observations at the back

Examine the sputum, noting particularly the daily quantity, the amount of pus, the presence of blood, and the smell

CHAPTER VI

THE ALIMENTARY SYSTEM

This chapter is chiefly about symptoms, and there is little in it concerning the technique of examination. When you want to read about the examination of the abdomen turn to the next chapter But pause awhile, if you will, to consider why this chapter is chiefly about the study of symptoms

Let us bear in mind the elementary fact that the digestive system consists of a long tube, much coiled in places, into which empty many secretory glands. Disturbances in and around the tube tend to lead to striking alterations in bodily function of which a patient cannot easily remain unaware For example, blockage of the upper part of the tube leads to difficulty in swallowing and the sensation of food sticking at a certain definite place, blockage nearer the middle part of the tube, shall we say at the pylorus, leads to copious vomiting and constipation, blockage of the lower part of the tube, in the colon for instance, leads to abdominal distension and constipation Furthermore, inflammation of the upper part of the tube tends to cause dysphagia, of the middle part vomiting, and of the lower part diarrhœa You will find therefore that, by listening carefully to the patient's story, you gain some idea as to the site of the disturbance of alimentary function

Physical signs, on the other hand, are often absent in disease of the alimentary system A tumour obstructing the œsophagus is certainly impalpable, while a tumour of the colon remains so for a very long time Peptic ulcers rarely produce physical signs, though they are spendthrift of symptoms When you also realize that this intestinal tube is particularly susceptible to disturbances of movement and function, conditioned by emotion rather than organic disease, you will understand why this chapter is chiefly about symptoms and so little about physical signs

It is difficult to talk about symptoms without entering upon the problem of diagnosis This is a book of methods rather than diagnosis, but, in order to illustrate the importance of a

good history in alimentary disorders, we shall have to describe the salient features of certain diseases and abnormalities of function. These descriptions are purely illustrative; they are not complete.

PAIN

Pain is probably the most frequent manifestation of alimentary disorder. The description of such a purely subjective sensation can, without other clues, often provide a complete diagnosis. It is obviously, therefore, a symptom which must be studied completely. If pain is present remember to determine:—

Two things about the pain itself—its character and its severity;

Three things about the location of the pain—its point of maximal intensity, its distribution, and its radiation,

Three things about the time relations of the pain—its date of onset, the duration of attacks, and their frequency of occurrence,

And, lastly, what eases the pain and what makes the pain worse When you know all this about your patient's pain you are a long way towards locating its origin

What else must you know before you can say that this pain is from the stomach and that from the gall-bladder? You must know certain generalizations about abdominal pains which have been deduced through years of medical experience, and certain facts which have been learnt from physiological experiments You must learn to recognize pain by its description You must know from which organ a particular type of pain is likely to arise, and what disorder of function this pain suggests We give you below a few generalizations which may help you to begin your studies and give you an interest in symptoms

'Colicky Pain'.—Typically this is a pain which makes the patient want to roll about to procure ease It is a pain which comes on in spasms and passes off, and then comes on again It is believed that colicky pain is caused by the excessive and *spasmodic contraction of plain muscle*, as happens, for example, in the segment of bowel just above an obstruction (*Fig* 45) Certain varieties are fairly easily recognized

a Œsophageal Colic —An intermittent, burning pain in the centre of the lower chest The pain is deeply situated and may be quite severe.

b Gastric Colic —Aching in character, epigastric in position, and tends to occur after meals.

c Small-intestine Colic.—Typically, occurs in the centre of the abdomen, severe, sharp in character, and gives rise to much restlessness The fluctuations in intensity of pain are rapid and violent

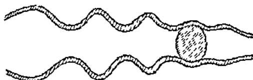


Fig 45 —Obstruction to the gut causing increased peristalsis.

d Large-intestine Colic —A pain with fluctuations in intensity The lower the site of origin of the colic the more easily can the patient localize the pain, for example, to the transverse colon, the sigmoid, or the rectum

e Biliary Colic —Pain very severe, "like a red-hot poker", maximal in the right hypochondrium but spreads all over the right side of the abdomen and chest and radiates through to the back and to between the shoulder-blades The pain usually remains constant for several hours, and then passes off fairly suddenly

There are other colics arising from abdominal organs not part of the alimentary system For comparison, here are the main features of the important ones

Renal Colic —Very severe, knife-like pain, maximal in the loin, radiates down the course of the ureter towards the genitalia or the inner side of the thigh

Uterine Colic —Severe or moderate pain, aching in character, increasing up to a maximum and then dying away, maximal low down in the pelvis or in the sacrum

Peritoneal Pain —This is the pain which is produced by the inflammation or irritation of the parietal peritoneum *It is a* pain which tends either to be constant, or to change very slowly in its severity and character, a pain which is felt superficially

and is associated with tenderness and rigidity of the overlying muscles. The patient with such a pain avoids movement lest the contraction of abdominal muscles should, by disturbing the parietal peritoneum, aggravate his discomfort. As a general rule, it may be said that pain of this character means that the peritoneum underlying that particular area is irritated or is inflamed so that the site of the pain is of great value in locating the disease. If the peritoneum lining the under-surface of the diaphragm is inflamed, breathing will be painful, and, because sensation from the centre of the diaphragm is carried by the phrenic nerve (C 4–5), inflammation in that area may cause pain to be referred to the tip of the shoulder on the same side Such a finding can be of great diagnostic value

Mesenteric Pain.—Enlarged or acutely inflamed lymphatic *glands in the mesentery undoubtedly give rise to pain, but the* characteristics of such a pain are less surely known than those of visceral or peritoneal pain. An intermittent aching pain associated with deep tenderness but without marked abdominal rigidity may suggest mesenteric disease

Nerve-root Pain.—Abdominal pain may be due to irritation of, or pressure upon, the spinal nerve-roots supplying the abdominal wall—that is, those arising between the 5th dorsal

called a 'girdle pain'

Peripheral Nerve Pain.—Involvement of peripheral sensory nerves by tabes or peripheral neuritis may cause various sorts of abdominal pain, but their description is beyond the scope of this book

DYSPHAGIA

Dysphagia means painful or difficult swallowing Hysteria, bulbar palsy, and certain anæmias may give rise to difficulty in swallowing, but dysphagia is usually due to disease of the pharynx or œsophagus Everyone must have experienced the pain on swallowing food which is such a feature of the common 'sore throat'.

It is strange that adults will sometimes have considerable difficulty in swallowing, and yet complain only of 'indigestion',

so you may have difficulty in getting at the truth On the other hand, a patient may be able to point his finger to the exact spot where the food seems to stick Any pain or obstruction in the pharynx is usually referred to the region of the cricoid cartilage, but below this the patient's localization of the lesion is often very accurate Be sure to ask the patient if he finds greater difficulty in swallowing solid foods or liquids. When solid food won't 'go down' at all but liquids will, an organic narrowing of the œsophagus is probably present When solids go down better than liquids neurological disease is likely.

VOMITING

Some people vomit more easily than others Some are sick at the sight of a channel boat or even a passport, while others claim to be nauseated by the Government When a patient vomits you have to consider the symptom in relation to his whole body and mind Severe giddiness, fever, uræmia, drugs, abdominal pain, raised intracranial pressure, and hysteria may all cause vomiting There is, however, a particular sort of vomiting which occurs when the alimentary canal is obstructed, it is persistent and copious and accompanied by considerable flatulence, the vomitus may contain food eaten a day or two previously or even fæcal material Obstructive vomiting, wherever the site of the obstruction, tends to be accompanied by colicky pains

If the obstruction is in the œsophagus the vomitus is alkaline and frothy Temporary spasm of the cardiac sphincter often occurs in patients with gastric neurosis or peptic ulcer, so that watery, tasteless fluid wells up into their mouths from time to time 'Waterbrash' is the name given to this type of eructation, it is hardly a vomit, though the patient will often say it is If the obstruction is at the pylorus, the act of vomiting is usually sudden and sometimes projectile in quality, the vomitus is copious and perhaps contains fermenting foodstuffs eaten several days previously If the obstruction is low down in the small or large intestine the vomitus may be fæcal, but this is a sign of obstruction which the surgeon never delays to see

APPETITE

Anorexia or loss of appetite is more often a symptom of general than of alimentary disease Just as when considering

loss of weight, your first concern should be to find out exactly when the symptom was first noticed and to imagine what the patient looked like before the symptom began. Find out whether the anorexia is complete, involving an active distaste for food, or whether it is incomplete due to general lassitude and apathy, to weakness, or to abdominal pain made worse by food.

INDIGESTION

People mean very different things by the word 'indigestion'. One man means pain, another means an uncomfortable feeling in the abdomen, another means flatulence. What the majority mean to say is that they have a dull, heavy feeling in the stomach which makes them lose their appetite and eructate uncomfortably soon after beginning a meal. This full uncomfortable sensation is very unpleasant but, luckily, it is far more often the result of a neurosis, of heavy drinking, or of heavy smoking for that matter, than of a serious organic disease. Pregnancy is likely to begin with this sort of indigestion, and anyone with unsuspected fever or heart failure may also com-

HEARTBURN

This is a sensation arising from the œsophagus. Most people have suffered from it and know what it is, but in case you are exceptionally eupeptic, heartburn is a hot burning feeling in the lower chest or upper abdomen. It may be due to acid from the stomach regurgitating past the cardiac orifice and irritating the sensitive mucosa at the lower end of the œsophagus, or it may be due to spasm of the œsophageal musculature. It occurs in pregnancy, and may be severe with organic disease of the œsophagus.

HÆMATEMESIS

Blood vomited from the œsophagus is bright red in colour and alkaline to litmus, whereas blood which has stayed even a short time in the stomach is partly digested by the gastric juice, so that when vomited it looks black or brown and granular like coffee-grounds and is acid to litmus.

FLATULENCE

This is either up ↑, or down ↓. (Don't use these arrow symbols too extensively, as did the delicately minded student who wrote, "Patient compains of indigestion ↓") Upward flatulence is the expulsion of air swallowed previously Air-swallowing is a bad habit, but difficult to avoid if one is suffering from any abdominal discomfort or nausea The short-lived and spurious relief which a good belch brings to the performer must be well known to all It is a symptom which is particularly common in gastric or biliary disease and after operations The old-style out-patient's flatulence was a remarkable phenomenon which made the rafters ring and the consultant smile, for he knew that it was done to please or impress him

Downward flatulence is caused by increased fermentation in the large intestine and occurs after the eating of large quantities of roughage, peas, onions, or drinking beer, or in constipated people. It is rarely a symptom of importance in diagnosis of disease

CONSTIPATION

If a patient complains of constipation, you must try to find out whether he,—

1 Is a life-long sufferer from constipation (habitual constipation)

2 Is ill with a general disorder such as diabetes mellitus or a fever

3 Has noticed a recent change in bowel habits not attributable to general disease

If the last, regard the symptom as of the very greatest significance, for it may mean organic obstruction of the bowel.

DIARRHŒA

Diarrhœa is often a symptom of general disease This is true particularly of children, for an infection anywhere in a child's body whether in the alimentary tract or remote from it, may cause most violent diarrhœa The bowel habits of an adult are rather more stable, but an anxiety neurosis, starvation, vitamin deficiencies and thyrotoxicosis, are all examples of conditions in which a general disorder may give rise to a

severe local symptom The character of the stool is all-*important in the differentiation of* diarrhœa due to local disease of the bowel, to abnormalities of absorption in the small intestine, and to general disease (*see* p 96).

TENESMUS AND PAIN ON DEFÆCATION

Tenesmus is a deep-seated spasmodic type of pain arising from the rectum It is a painful 'drawing' sensation which occurs immediately after defæcation, and lasts for a few minutes afterwards A sharp pain occurring during the act of defæcation usually means an anal lesion

MELÆNA

Blood arising from a hæmorrhage high up in the alimentary tract (as from a duodenal ulcer) is partly digested before it is passed Usually it is passed by frequent bowel actions as black, tarry, or sticky stools The black stools which are passed by patients taking iron or bismuth by mouth are small, well formed, and not sticky Blood arising from the large intestine is dark red, jelly-like, and streakily mixed with the stool Blood arising from the rectum or the anus tends to be bright red in colour, and either to be separate from or to coat the surface of the stool

PHYSICAL EXAMINATION

Your patient's chief symptom determines where the emphasis is to be laid in your examination of his alimentary system If he complains of diarrhœa you must examine the anal region, inspect the inside of the rectum with your protoscope, palpate the inside of the rectum with your finger, and examine the stool There is a minimum which, however, must be done in all cases

The Tongue and Mouth —The tongue is said to be the mirror of the stomach, and certainly it is a striking fact that a patient with a smooth shiny tongue often has an atrophic gastric mucosa When looking at the tongue, see whether it has been indented by the teeth or has any superficial ulcers upon it A furred tongue usually means that the patient has not been eating normal food, which would by its abrasive action have

cleared the dead epithelium (fur) from the surface of the tongue, any ill patient who is not eating well may therefore have a furred tongue Let it also be remembered that many people even in health always show a furred tongue; it is worth while, then, asking the patient about the usual state of his tongue, he will be sure to know if neurotic! A cracked or fissured tongue may also be a normal finding, especially in old age, it doesn't mean a fissured stomach

Look carefully at the lingual papillæ Sometimes they are completely absent, sometimes they are badly formed, flattened, and smooth Papillæ tend to disappear from the outer margins of the tongue before disappearing from its centre The smooth tongue so often seen in patients with iron deficiency or in Addisonian anæmia is usually due to the iron or cyanocobalamine deficiency, but in some patients it is an irreversible condition perhaps linked with the fundamental gastric mucosal atrophy A sore red or magenta tongue covered by badly formed papillæ is found in patients with vitamin-B deficiency, such patients also may have cracks or sores at the corners of their lips, and these you should notice Manifestations of vitamin-B deficiency are not uncommon in those with alimentary disorders

Look carefully at the back of the throat, always remembering that a hæmatemesis may be due to vomiting of blood which has trickled down from the nasopharynx, and that you may actually be able to see this happening

The Neck —Look for swellings of the neck, and palpate above the clavicles for enlarged lymphatic glands Secondary metastases from abdominal carcinomata sometimes develop there

The Abdomen —Much can be learned from inspection alone, and you should be prepared to devote considerable time to discovering whether you can detect the outlines of any abdominal viscus These are never visible in healthy adults Their presence can be easily overlooked if inspection is either too hurried or carried out in bad light and it is extremely important to inspect the abdomen at every phase of respiration and from several angles When a patient complains of persistent vomiting or other symptoms suggestive of a partial obstruction of the alimentary canal you should set out deliberately to encourage the excessive peristalsis which tends to occur in the part of the alimentary canal cranial to the obstruction and which may be visible through the abdominal wall Give

the patient a glassful of water to drink, or flick the surface of the abdomen with the finger and then watch with your eyes at the level of the abdomen

Hypertrophic pyloric stenosis of infancy is an example of high intestinal obstruction which presents special problems The child must be examined during a good feed, preferably the type of feed to which it is accustomed—a breast feed if necessary—and its abdomen must be inspected as the child lies on the mother's or the nurse's lap The 'golf-ball' waves of peristalsis pass across the epigastrium from left to right, ending at the right border of the right rectus sheath To feel the hypertrophied pylorus in spasm you must for once disobey the usual rules for palpation of the abdomen Sit on the left-hand side of the child and use your left hand. On the tiny belly of the infant the left hand can conveniently hook round the rectus muscles, so that the middle finger and fore-finger come naturally into the position where the tumour is likely to be felt The right hand would be at a disadvantage in this situation You should feel for the swelling after observing the peristaltic waves and in the region where the waves come to a stop. Above all, feel for this acorn-shaped tumour at the moment when the infant is about to vomit or is actually vomiting Your clothes must suffer if need be, for a pylorus felt to contract firmly is sufficient evidence for a firm diagnosis.

With obstruction low down in the small intestine, a zig-zag or 'step-ladder' pattern of distended gut is seen in the centre of the abdomen, while with obstruction of the large intestine, the colon may stand out in huge coils

The Anus and Rectum.—In most alimentary disorders it is essential to examine the anus and rectum

Inspection of the anus may reveal fissures—a common cause of nagging, rectal or sacral pain—external hæmorrhoids, a discharging sinus, or a fistula Proctoscopic examination of the lower rectum—so simply done—provides much useful information in cases of chronic diarrhœa Inflammatory diseases of the colon such as the dysenteries and ulcerative colitis usually show visible changes in the rectal mucosa, while hæmorrhoidal varicosities, polypi, and carcinomata may all be seen through the proctoscope (It is better to use a small-bore proximally lighted sigmoidoscope for proctoscopy than the usual type of illuminated proctoscope) If ulcers are present

in the mucosa of the rectum you should note particularly their characteristics, shape, depth, type of edge, and whether the ulcers are separated from each other by healthy-looking or inflamed mucosa Swabs taken from the rectum are often of greater value to the pathologist than is a specimen of stool

Digital examination of the rectum should always be made if there is doubt about the diagnosis of alimentary, pelvic, or abdominal disease Not only may information about the internal condition of the lower rectum be obtained, but also other pelvic and lower abdominal masses may be felt and defined Many are the aphorisms—"Put your pride in your pocket and your finger in the rectum" "If you don't put your finger in the rectum, you will put your foot in it"—which have been composed to illustrate the importance of the manœuvre Nevertheless, it is strange how often doctors forget to do it If you don't want to be misled, therefore, be sure that a good rubber glove or a finger-stall is always ready for your use Too often for the want of a glove the examination is not made When you intend to make a rectal examination tell the patient exactly what you are going to do, then ask him to curl up on his left side so that his chin comes as close as possible to his knees To insert the index finger as painlessly as possible into the rectum you should first press gently on the anal orifice with the volar surface of the tip of your finger for a second or two, after which you will find that by altering the direction of your finger it enters easily Wait a moment to allow the patient to relax, and then palpate as far up in the pelvis as you can Polypi are not usually palpable, so don't fall into the common trap of diagnosing polypi after feeling the soft edges of the rectal valves If a mass is felt make sure of its exact position and relation to the rectum, test its mobility, and if possible, with the other hand on the abdomen, try to examine it bimanually Next, turn the finger round so that the sensitive volar surface of the tip faces anteriorly, and define the prostate in the male and the cervix uteri in the female You should feel the two lobes of the prostate and the raphe between them quite clearly If the prostate feels abnormal is it often worth while to move the patient into the knee-elbow position, as with the patient in this position you can best feel the gland

EXAMINATION OF THE STOOLS

Unpleasant as it may seem to the uninitiated, much information can be obtained by inspection of the stools In the ordinary case it is enough to ask the patient to describe his stools, but if they are excessively dark or light in colour, are blood-stained or loose, it is always as well to look at them yourself.

Dark Stools —*These may be due to drugs such as bismuth, iron, or charcoal, or to altered blood passed into the alimentary tract somewhere above the ileocæcal valve* It is most important to distinguish between the one and the other, and this can be done partly after listening to the history and partly by inspecting the stools Altered blood makes the stools tarry and sticky in consistency, whereas the dark stools due to drugs *are essentially normal except for their colour*

Blood in Stools.—Streaking of a normally formed stool by bright blood is usually due to bleeding hæmorrhoids or an anal fissure Darker blood more or less intermingled with the stool probably comes from higher up in the large intestine

Loose Stools.—

a Inflammatory diarrhœa If acute this may produce only *loose, watery, and offensive stools containing many particles* of undigested food The stool of chronic inflammatory diarrhœa, on the other hand, has certain characteristics which you can see The stool is not only loose and offensive, but also contains an excess of mucus and either streaks of dark jelly-like blood or thin pus This sort of stool may also be passed by patients with cancer of the colon or rectum, and is then due to the *degeneration in and inflammation around the growth*

b Fatty diarrhœa This occurs either when the bile or pancreatic juices fail to enter the duodenum, or when there is some failure of the small intestine to absorb fat If the bile does not reach the duodenum the stool tends to be fairly firm and very pale owing to the absence from it of pigments derived from the bile On the other hand, when there is failure of absorption of fat due to causes other than the absence of bile, the stools tend to be rather darker in colour, looser, frothy, soapy, bulky, and very offensive

c 'Symptomatic' diarrhœa due to general diseases has no special characteristics The stools are loose and probably offensive

The Stools in Children.—The napkins of infants can provide important information; but, alas, many doctors evidently "fall between two stools", for they never trouble to examine them

To learn to know the normal make the most of your opportunities while in hospital If you look at the stools of infants in the ward you will begin to understand the meaning of those variations in colour and consistency which may be of value in diagnosis

Meconium is the scanty, blackish-green, sticky, and odourless material passed by the infant in its first few days of life Before the end of the first week the stools become golden-yellow but remain unformed and with little odour In the breast-fed infant the stools should be a semi-liquid paste In the artificially fed infant, who takes more protein and fat in his diet, the stools are paler and drier and more like a putty than a paste As the infant grows older and takes less milk but more solid food, the stools naturally become darker, fewer, and more odorous

Disturbances of function may be inferred from various changes in the stools For example *starvation* and *underfeeding* make the stools revert to their neonatal condition In such cases there is almost no residue, and all that is seen upon the napkin is a green smear consisting mainly of debris and derivatives of bile The yellow colour of normal stools is produced by partly unchanged bilirubin The colour may change to pale green either before or after being passed, but this is a normal process resulting from the oxidation of bilirubin to biliverdin, and the colour depends on the time which is taken before the stool is passed and examined In *infantile diarrhœa* the colour of the stools may vary from dark spinach-green in mild cases to an ominous orange red which portends the approach of death These changes are partly the result of normal oxidative processes, and partly the result of changes in the bile due to the liver damage which occurs in such moribund patients

The *number* of the stools is of less importance than their character, since the number varies so much with the habit, temperament, and circumstances of the infant Prolonged sucking, for example tends to promote intestinal peristalsis, which culminates in the passage of a motion

The *consistency* and bulk of the stools will prove of some diagnostic help to you In particular, the soft, bulky, clay-like stools of cœliac disease and fibrocystic disease of the pancreas bear witness to abnormal fat-absorption. Frothy stools are due to fermentation (formation of carbon dioxide + water) of excess carbohydrates in the diet Too much starch or sugar in the feeds will cause the infant to pass such stools Undigested protein causes large yellow-grey curds in the stools. Small white curds are due to soaps and are therefore merely a normal product of fat digestion The faster the passage of the stools the less water is absorbed and consequently the more liquid will the stools appear If the speedy passage is due to inflammatory bowel conditions the loose stools will contain more than the normal small amount of mucus In dysenteric conditions the mucus is bloodstained Blood may also result from other causes, in the first few days of life melæna neonatorum is by far the commonest cause Intussusception, especially in the later stages, may cause the passage of almost pure blood like 'red-currant jelly'

The normal sour *odour* of infants' stools is mainly due to the presence of fatty acids from the milk diet With the addition of more solid foods, especially proteins, the odour of putrefaction becomes pronounced With excess protein in the diet, or where digestion is impaired, the stools stink

SUMMARY

Study your patient's symptoms with a view to determining what error of alimentary function is producing those symptoms

Examine the patient's abdomen and rectum and stools with a view to confirming your functional diagnosis and in the hope of reaching a more exact pathological diagnosis

CHAPTER VII

THE ABDOMEN

THE common masses to be felt in the abdomen are physiological: they are the gravid uterus, the distended bladder, and fæces. You will be spared some humiliation if you carry these possibilities in your mind, and an enema syringe and a catheter in your diagnostic armamentarium. Consider this triad in every case before you set about the systematic examination of the abdomen in the way to be described now.

The traditional routine of inspection, palpation, percussion, and auscultation is followed for the abdomen as for other regions, but with one marked emphasis: palpation is far and away the most important of these methods in abdominal diagnosis. For this reason you are advised to concentrate on palpation, as you will see has been done in the following description. A good history and a practised right hand will take you a long way in abdominal diagnosis.

I. INSPECTION

Look not only at the abdomen, but also at the whole patient: a rickety child appears to be pot-bellied partly because of its flabby muscles (*see Fig.* 15). Inspect the patient's abdomen in a good light, paying attention to three features: *shape, surface*, and *movement*.

Shape.—The entire abdomen may appear big, because of fat, ascites, or gaseous distension. Alternatively, the abdomen may appear irregularly enlarged, as occurs with a distended bladder, other large organs, or localized distension of the alimentary canal.

Inspect the back as well as the front: it is not rare for an apparently swollen abdomen to be produced by unsuspected lordosis.

Surface.—Enlarged veins are always abnormal. The classical but rare 'caput Medusæ', with veins radiating out from the umbilicus, compensates for obstruction to the portal veins. Obstruction of the systemic veins (as by a tumour, or even

ascites) tends to enlarge superficial veins all over the abdomen and you will find that the blood courses upwards in this collateral circulation (*Fig* 46).



Fig 46 —Distended superficial veins in a patient with an abdominal tumour

Occasionally you may observe such rarities as carcinomatous nodules or a discharging sinus on the surface, providing an indication of what you are likely to find in the depths

Movement.—The abdomen normally expands with inspiration Absence of movement may be bilateral, as in widespread peritonitis or with the diaphragmatic paralysis of anterior poliomyelitis, or it may be unilateral, as with one-sided diaphragmatic paralysis

It is extremely important to observe whether the intestinal movements are visible through the abdominal wall. Peristalsis may become visible merely because of extreme wasting, otherwise it is pathognomonic of some form of intestinal obstruction. You can, by looking carefully, judge which part of the intestine is obstructed.

Percussion and auscultation are briefly described next, to dispose of them quickly and leave you fresh to concentrate on the delicate and rewarding art of palpation.

II. PERCUSSION

Percussion over gas in the intestines produces a drum-like resonant note, over solid organs or fluid the note is dull. It is, however, so common for the gut to ride over solid organs that only the diagnosis of free peritoneal fluid really depends on percussion (see p. 104). For example, the spleen is rarely percussible unless it is grossly enlarged, and other large masses may not lend themselves to accurate percussion because of overlying intestine. Do *not*, therefore, rely too much on percussion, but remember when you do use it to employ moderately heavy strokes and to percuss from resonant to dull, roughly parallel to the border of what is suspected to be abnormal.

III. AUSCULTATION

Auscultation can be of real help in acute abdominal conditions. The faint irregular gurgling noise which accompanies normal peristalsis can be heard over most of the abdomen, though you should be prepared to listen intently with your stethoscope for several minutes to hear it. In such conditions as peritonitis and paralytic ileus no sounds are heard, but in intestinal obstruction bowel sounds are increased and may be audible even to the patient and his relatives.

IV. PALPATION

Those who approach palpation wrongly may be divided into three groups: the casual prodders, the ponderous pushers, and the persistent pokers.

To achieve success make the examination as easy as possible both for your patient and for yourself. You must practise consciously and deliberately

Start by attending to the patient He should be reassured and at ease mentally—your success in achieving this desirable state depends on the depth of your sympathy and understanding He must be lying perfectly comfortably, and under- trunk flat, and the head supported on one or two pillows, with the arms should be resting loosely at the sides, and it sometimes helps if you place a pillow under his knees The to breathe naturally and easily, but rather more deeply He should be told usual

The patient must be relaxed and warm, and so must you Above all, be sure your hands are warm, because they are then more sensitive Cold hands also prevent relaxation in the patient Stand or seat yourself comfortably at the patient's right side, so that your flat right hand is naturally on a level with his abdomen Touch his skin gently (almost caressingly!) for a few moments, and then gradually permit most of your hand (not merely the finger-tips) to sink deeper and deeper into the abdomen each time it softens as the patient breathes out This procedure can be so gentle and undisturbing that it may be carried out on a sleeping child without waking him, in intussusception, for example, it may provide your only available means of diagnosis You must be prepared to take time, if you are, you will achieve a sensation as if your hand had become almost part of the patient's abdomen Once your hand is comfortably established in the abdomen it moves naturally with the patient's respiration, and any other movement you make must be gentle though deliberate portant to start palpation in a be free fro

the fluid and is felt very distinctly by the palpating hand. When there is much fluid and the liver is enlarged, it may be felt by 'dipping' The fingers of the right hand are firmly dipped into the abdomen in the liver area, and almost instantaneously removed The sensation of 'ballottement' is quite characteristic. the liver seems to bounce off your fingers

On *percussion*, dullness characteristic of ascites will be obtained (*Fig* 48) With the patient supine, and with a large

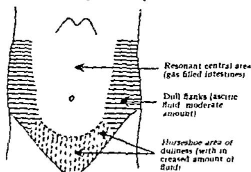


Fig 48 —Ascites demonstrated by percussion (patient in supine position) Note that the fluid gravitates to the lowest parts of the abdomen with changes in position of the patient the limits of dullness therefore shift

effusion, the dullness is in the form of a horseshoe which includes the suprapubic area and both flanks, with moderate effusions you will find dullness only in the flanks In both the central area, where the gas-filled intestines float, is

in theory, but in practice we have found it less logical than ludicrous Try it for yourself, and try also to diagnose ascites by the spongy feel obtained on rectal examination, with the patient's shoulders tilted up, a recent method for which great precision has been claimed

There are a few conditions in which the signs may be confused with those of ascites With ovarian, omental and hydatid

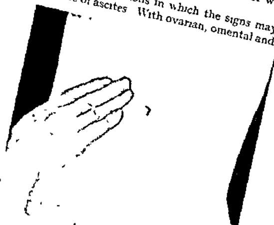


Fig 49 —Palpation of the liver

cysts, for example, you may elicit a 'fluid thrill', and with a bilateral hydronephrosis there may be dullness in both flanks Curiously enough a distended bladder most frequently causes confusion, although it is difficult to understand why The combination of horseshoe dullness which shifts and a fluid thrill, is pathognomonic of ascites

2 ENLARGEMENT OF VISCERA

Before you decide that an organ is abnormal, ask yourself if you know the normal Check on your estimates repeatedly by examining a wide range of normal abdomens

Liver —In healthy adults especially if they are fat the liver may not be palpable at all Frequently however the edge is

felt a finger-breadth or more below the ribs The liver is an organ of firm consistency, with a smooth sharp lower border lying mainly in the right hypochondrium but passing across the epigastrium, and moving with respiration On palpation it is impossible to get above the liver; in health, as a rule, only the lower edge can be felt, passing across and upwards towards [illegible]

done

right



Fig 50 —Palpation of the liver (alternative method)

hand low down in the abdomen, in the right iliac fossa, with the fingers pointing obliquely upwards across the abdomen Each time the patient breathes out slide your hand a little farther up towards his chest, and eventually the liver edge may strike your hand as the patient breathes in (*Fig* 49) At that stage try to feel along the edge of the liver as far to right and left as you can In this way you will detect not only generalized enlargement (as in chronic venous congestion) but also localized enlargement (as with neoplastic deposits) Gauge also if the liver is tender, but first try palpating your own liver to remind yourself that firm pressure on even a normal liver is not exactly comfortable If the liver is large enough try now to palpate its surface, it may be grossly irregular or nodular in post-inflammatory or neoplastic conditions

Gall-bladder —Only rarely is this organ palpably enlarged, in these cases it is felt as a smooth, tense mass projecting eneath the liver more or less in the nipple line More often

reach Pass your left hand round the patient's left axilla until it lies behind the left lower ribs Press these ribs firmly towards you, and as they are moved forward they render the spleen more accessible to your right hand. One further precaution is necessary, because in acute infections the enlarged spleen may be so soft that firm palpation fails to differentiate the organ from the surrounding tissues In this type of illness (e g. septicæmia, typhoid) you should palpate gently and rather superficially to feel the spleen. In children an enlarged spleen is sometimes palpable considerably more laterally than you might expect, so feel first in the same way as for adults, and then repeat your routine but aiming this time at the posterior axillary line

However large it grows, the spleen conveniently tends to retains its original shape. It moves with respiration, it has a sharp medial edge, in which the notch may often be felt, it enlarges downwards and obliquely across the abdomen; and it can be followed up under the rib margin.

If you feel a mass with all these features it can be only the spleen, but in doubtful cases an enlarged left kidney may need careful differentiation If considerably enlarged, the kidney tumour may become wedged under the ribs and appear to arise from there It tends, however, to enlarge across the abdomen instead of downwards, has no sharp edge or notch, and can generally be followed back into the loin Percussion may help in distinguishing between the two, the resonant descending colon may sometimes be percussed in front of the kidney tumour, but lies to the side of and behind a splenic tumour.

Kidney.—Because they lie so deeply the kidneys are difficult to palpate The lower pole of the right kidney can sometimes be felt in healthy adults In infants the lower part of both kidneys may be palpable, and often fœtal lobulation can be made out, especially in a marasmic infant

Again, you are advised to palpate for either kidney with your right hand, and from the patient's right side (*see Figs* 53, 54) As in the case of the spleen, you will need to use your left hand for the less accurate task of narrowing the space in which the kidneys move The right hand presses firmly into the abdomen in the flank you are examining, with fingers pointing up towards the nipple on that side Meanwhile the left hand is passed behind the soft interval between ribs and

pelvis, and presses equally firmly up towards the palpating hand When the patient takes a deep breath the kidney comes down into the narrowed space between the two hands, where it is felt

The normal kidney is moderately firm, smooth, and not tender With practice you can assess any enlargement, and you may feel irregularities of the surface A really large renal tumour does not retain the shape of the kidney and has the characteristics listed above when discussing the differentiation from splenic enlargement

Remember you are dealing with three-dimensional objects, not photographs, and examine the back as well as the front You may find an apparent renal tumour arises from a diseased spine, or you may see œdema and redness in the renal area behind—vital evidence of extrarenal infection which may easily be missed

Bladder—This is an abdominal organ in infants, but becomes pelvic in adults If pathologically distended it may be seen, felt and percussed Having looked for the bulge it may produce start percussion or palpation well away from the suspected area and proceed towards it but you must proceed delicately, or you will miss the soft rounded swelling arising from the pelvis and varying in position as the patient moves A certain diagnosis is made by catheterization but remember that once the bladder has been successfully emptied you must still find out why it became enlarged in the first place

Gravid Uterus—You will have ample opportunity in the obstetric department for learning to diagnose enlargement of the uterus Remember it as a possibility in every female of child-bearing age

3 ABDOMINAL TUMOURS NOT ARISING FROM VISCERA

To diagnose an abdominal tumour get away from it In other words diagnose by considering *all* the evidence and not merely the lump This chapter describes only methods of examining the abdomen but you will derive the essential additional evidence from the history (e g duration of symptoms such as disturbed function) and from the general examination of the patient

Certain characteristics of abdominal tumours are of great value in diagnosis There are five main features; of these the *position in the abdomen* is probably the most important single one, but *size*, *multiplicity*, *mobility*, and *consistency* also provide helpful evidence Before proceeding to discuss these characteristics it is helpful to recall the features of fæcal masses, they indent on deliberate pressure with the finger, and they vary in position from time to time, and an enema may dissolve away both the mass and your doubts

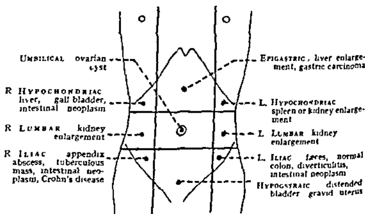


Fig 52 —Abdominal masses Diagram illustrating the importance of the site in diagnosis (*Note* The examples given emphasize probabilities, but exceptions frequently occur)

1 Position.—The position of a tumour must be determined precisely Your next task is to make out whether the mass is part of an abdominal viscus, to do this try to determine whether the neighbouring viscera can be separated from it If the tumour is not in the region of any organ think, as always, of fæces first of all, then consider neoplastic growths and inflammatory masses

The accompanying diagram (*Fig* 52) illustrates which are the commonest masses in particular regions of the abdomen

If the tumour arises in the abdominal wall you will observe variations in the size, shape, and consistency when you ask the patient to tighten up his muscles, as he does by lifting his head when he is in the prone position

2 Size —If the tumour is extremely large clinical diagnosis may be impossible A large cyst, for example, whatever its origin, tends to occupy the middle of the abdomen for 'Lebensraum' In practice, however, it is found that an extremely large central cyst usually arises from the ovary

3 Multiplicity —The presence of many lumps rules out many diagnoses A primary intestinal tumour, or a growth arising outside the abdomen may give rise to multiple abdominal masses by metastasizing in glands, liver, and peritoneum, but you should consider fæcal masses first and tuberculous masses second according to the degree of probability

4 Mobility —Only with small tumours is the degree of mobility of much help in diagnosis In the early stages, if the organ from which the tumour arises moves with respiration the tumour moves with it On the other hand, tumours of the pancreas and uterus are rarely mobile

5 Consistency —By constant practice learn to recognize the feel of those healthy organs such as the liver and the lower pole of the right kidney, which are accessible If these organs become enlarged it is important to determine whether their consistency remains normal, and only your experience of normal organs will enable you to decide If the consistency of any enlarged organ is not uniform it suggests neoplastic deposits or degenerative changes Most malignant tumours are hard and tend to be irregular so you must not be content to feel only that part of the organ which comes easily to hand

In a large cyst you can elicit fluctuation To do this place both forefingers firmly on the mass at a considerable distance from each other then press sharply with one finger If a fluid wave impinges on the other finger the mass is said to fluctuate You can produce the same sensation by the same method across the fibres of normal muscle This is in fact a good way to learn the feel of fluctuation and you should try it on your own thigh or calf muscles If the cyst is under very great tension fluctuation is however difficult to demonstrate Paget's test will then help to differentiate it from a solid tumour in which the hardest part is in the centre, whereas in a cyst the centre is the softest part

SUMMARY

Inspection, palpation, percussion, and auscultation are all useful in the diagnosis of abdominal abnormalities, but of these palpation is by far the most important, and deserves special study and practice.

Ascites can be recognized by its characteristic signs, but diagnosis is not complete until the cause of the ascites is also determined.

The commonest palpable masses in the abdomen are formed by fæces, distended bladder, and gravid uterus Pathological masses in the abdomen may be due either to enlargement of viscera or to other causes. Five features must be determined in the examination of any mass—namely position, size, multiplicity, mobility, and consistency.

CHAPTER VIII
THE UROGENITAL SYSTEM

THOUGH physicians and surgeons, urologists, metabolists and endocrinologists have divided urogenital disease among themselves, the general practitioner more than anyone remains the first judge and preserves that integrated view of the patient and his disease which is so important As a student you should try to see thing with a general practitioner's eyes

As with disease of the alimentary system, careful hearing of the patient's symptoms and intelligent inquiry will often be of more value than physical examination in diagnosis Renal colic, for instance, that dramatic event which can within a few moments make a strong man writhe in agony, may produce no more physical signs than a cold sweat on the forehead and pallor But listen to the patient's description of a pain like a red-hot knife shooting through and through his loin close to the spine, and darting down towards the groin so that the inner aspect of his thigh and his scrotum and his penis may burn in sympathy, and you know for certain that there has been some obstruction to the normal peristaltic action of the ureter on that side

Vagaries in the habits and processes of micturition are legion *Frequency of micturition* may be due to *polyuria* or to an irritable bladder which cannot hold more than a few ounces of urine at a time It is your first task to find out by inquiry which of these two types of frequency troubles your patient How often does he pass water during the day? And during the night? How much approximately does he pass at a time?

Painful or difficult micturition is known as *dysuria*, when your patient complains of it you will want to know whether the pain occurs throughout the act, at the beginning or at the end

Difficulty in starting micturition is far commoner in men than women—it may be due to psychological or neurological causes —whereas *incontinence*, particularly temporary incontinence after laughing or straining, is far commoner in women This

difference is related to the different lengths of the urethra in a man and woman. A long urethra is more easily obstructed, a short urethra more easily rendered patulous If incontinence is present you must find out whether it occurs chiefly after straining, coughing, laughing, etc.—if so, it *is probably due to* a mechanical weakness of the urethral sphincters If it occurs without the patient being aware of the urine coming away, the cause is likely to be found in disease of the nervous system. *If it occurs owing to the patient not having sufficient* warning of the desire to micturate (*precipitancy* of micturition), the cause is also likely to be neurological

Men may complain of a poor and *feeble stream of urine*, or dribbling at the end of micturition. These symptoms mean some obstruction in the urethra itself, either in the prostatic region or lower down

Discharge from the urethra may be watery or mucinous or purulent Don't forget that watery discharges may be physiological in young men, but may cause much anxiety which you can easily allay.

SCHEME OF EXAMINATION

This is essentially simple —

1. Inspection and Palpation of the Abdomen —Pay particular attention to the loins (*Figs* 53, 54) (*See* p 108)

2 Inspection and Palpation of the External Genitalia — Examine the urethral orifice, whether your patient be male or female, and look for evidences of inflammation or purulent discharge *In the female you may see a small raspberry-like* granuloma—a caruncle—at the urethral orifice Such a tiny lesion may cause most distressing symptoms, and since the patient probably won't know it is there and won't point it out to you, you will miss finding *a treatable condition if you don't* specially look for it.

Inspect and palpate the testicles and spermatic cord You can make out the shape of the testis itself, of the epididymis behind, and of the spermatic cord *If a swelling is present* note its shape, size consistency, and surface, and try to determine whether it arises from the testis (*anterior*) or epididymis (*posterior*) or the cord (*superior*) Cystic swellings will transmit light Note whether the swelling is tender, attached to the scrotum, or is hot and surrounded by œdema

3 **Glands**—Look and feel for enlarged inguinal glands Note their number, tenderness, and evidences of inflammation



Fig 53—Palpating the left loin



Fig 54—Palpating the right loin

in the whole drainage area, but remember that small glands are palpable in most normal people

4 **Rectal Examination.**—This is best done with the patient in the knee-elbow position or facing towards you with the

upper thigh fully flexed (*see* p. 95). Sweep the pad of your index finger over the posterior surface of the prostate. You should *feel two smooth lobes, each about a centimetre in* diameter and separated by a shallow valley, the median raphe The consistency of the normal prostate should be firm but not hard, and it should not be tender, though very firm pressure may cause a deep-seated discomfort.

Sweeping your finger higher you may feel on either side and above the prostate the two seminal vesicles, and between them the posterior surface of the base of the bladder. It is useless, by the way, to try to make a satisfactory rectal examination of the prostate and the bladder neck if the bladder is full

EXAMINATION OF THE CENTRAL NERVOUS SYSTEM

Whether a complete examination is necessary or not depends upon the history of the case A history of incontinence or of precipitancy of micturition is a direct indication for such an *examination*

THE URINE

An old eighteenth-century lampoon referred to medical discussions and conferences as "Pot Politics". Long before that time doctors had taken a great interest in the colour and composition of the urine, and rightly so, since the urine, as a modified filtrate of the blood, reflects the condition of the body fluids The patient with a bleeding disease may pass a bloody urine, the dehydrated patient a dark-coloured concentrated urine, the patient with alkalosis an alkaline urine, while normal people pass an acid urine because their diet contains an excess of acid radicles These are just a few of the more patent examples of the way in which the composition of the urine reflects the state of the blood

Inspection.—The first thing you must do when examining a patient's urine is to look at it! A clear amber liquid may suggest nothing abnormal to you and may indeed be quite normal But if you see threads of epithelial debris floating there it should make you think that the urine comes from a patient with some infection of the lower urinary tract such as urethritis prostatitis, or cystitis Faint 'cumulus' clouds suspended

in the urine are formed of mucus from the bladder and are only a manifestation of a physiological process An infected urine is sometimes frankly purulent, but most often is just faintly hazy. When you hold it up to the light and the haziness shimmers, the presence of pus cells is suggested. Urine which contains blood is sometimes dark red, but more often a dull smoky-brown colour. Urine containing bile-pigments is a dark mahogany brown and froths easily.

When the urine has stood for an hour or so, insoluble matter settles to the bottom of the vessel, but this deposit may be obtained more quickly by centrifuging Sometimes, particularly in a concentrated or an infected urine, the deposit is very heavy. The commonest is of whitish material, phosphates, which are soluble in acetic acid A deposit of a light pink or brick-dust colour, composed chiefly of insoluble urates, may come down in the urine of normal infants or in the highly concentrated urine of patients with heart failure or fever It disappears on heating Where there is disease of the urogenital system the deposit may contain pus cells, red cells, or casts, these can be recognized only by microscopical examination

Physical Examination —

a Measurement of Specific Gravity—Test the specific gravity of the urine, with the following precautions Let the urine cool before testing, then remove surface froth Use a vessel wide enough for the urinometer to float clear from the sides, lower yourself so that your eyes look along the level of the surface of the urine, and read off the figure on the shaft of the urinometer at exactly this level

b Measurement of Quantity—A twenty-four hour specimen is valuable The total quantity of urine passed in that time varies with the weather (less in hot weather) and the age of the patient (less from a child), but significant departures from the normal 1·5 litres should be recorded The secretion of urine falls when the arterial pulse pressure falls as in conditions of shock or hæmorrhage, or when the venous pressure rises, as in heart failure, or when the body loses fluids from other sources, as in diarrhœa, vomiting or with the development of subcutaneous œdema The urinary volume is also decreased in acute nephritis, where the inflammation and swelling of the kidney probably act as a mechanical bar to glomerular filtration

The volume of urine secreted increases when kidney function begins to fail, as in chronic nephritis (since the kidney cannot concentrate solids a copious dilute urine is passed to get rid of the equivalent amount of solid waste) There is also increased secretion when the urine contains excess quantities of sugar, or when the body is unloading œdema fluid

About twice the amount of urine is passed by day as by night The night urine is dark and concentrated This is not so, however, in infants, or in adults with chronic nephritis, none of whom have the power of concentrating their urine to the same degree. If possible, therefore, collect the night urine and the day urine separately.

c *p*H —Test the reaction of the urine with litmus paper

Chemical Examination of the Urine.—Only commonly used chemical tests are described here.

1. *For Protein* —Fill the test-tube three-quarters full of urine Hold it by the base and heat the top half-inch of urine over a flame till it boils If cloudiness appears in the boiled area add a few drops of acetic acid and boil again, a phosphatic cloud then disappears while a protein cloud remains.

Protein may also be precipitated by salicylsulphonic acid, and this method of testing avoids the use of a flame

2 *For Sugar* —Quickly invert over the sink the test-tube used in the test for protein, so that nearly all the urine runs away Enough remains on the side walls of the tube for the sugar test Add to it about 3 c c of Benedict's solution and boil again, this time holding the top of the test-tube with a slip of paper or metal holder Boil for at least a minute, noting any reduction of the copper salts to cuprous oxide which will colour the blue reagent green, yellow, or red, according to its quantity A more accurate method is to add 8 drops of urine to 5 c c of Benedict's solution and boil for two minutes To avoid the use of a spirit lamp or burner "Clinitest" or similar tablets can be dropped into a mixture of urine and tap water, heat is liberated by a chemical reaction and the copper salts are reduced to varying shades of yellow according to the quantity of glucose, just as in the Benedict test

3 *For Ketones* —Pour 10 c c of fresh urine in a tube and dissolve in it about 5 g of crystalline ammonium sulphate Add a crystal of sodium nitroprusside or a few drops of a 5 per cent nitroprusside solution and then 2 c c of a strong ammonia

solution Invert the tube over your thumb a few times and leave to stand If a purple, 'permanganate' colour develops, acetone bodies are present "Acetest" or similar tablets are so compounded that a purple colour is produced when the tablet is moistened by urine containing acetone

4 *For Bile-pigments*—Dilute 1 c c of tincture of iodine with 5 c c of water in a test-tube Almost fill another test-tube with urine, then run the dilute iodine solution gently down onto the surface of the urine If a green ring develops at the junction of the two fluids bile-pigments are present 'Icto-test' tablets can be used to test for the presence of bilirubin in the urine Five drops of urine are run on to a square of filter paper and the tablet is then placed on the moistened paper and 2 drops of water are run on to the tablet If bilirubin is present, a bluish coloration develops within 30 sec and the intensity and speed of the colour reaction give some indication of the quantity of bilirubin

5 *For Urinary Chlorides*—Using a pipette, measure 10 drops of urine into a test-tube Rinse the pipette in distilled water and add one drop of a 20 per cent potassium chromate solution Rinse the pipette again and add, drop by drop, shaking the tube after each drop, a 2 9 per cent silver nitrate solution The end point is reached when the colour changes from red to brown Roughly, the number of drops of silver nitrate solution added indicates the concentration of chlorides in grammes per litre of urine

Microscopy.—It is wrong to diagnose the presence of pus or blood in the urine by chemical tests, since these are by no means accurate Pus, blood, and urinary casts should be searched for under the microscope The urinary deposit obtained by sedimentation or centrifuging provides you with suspended solid matter Place one drop of this on a clean glass slide, cover with a slip and focus on it with the low power objective of the microscope Change then to the high power objective and search amongst the debris and crystalline material which are almost inevitably present in such a urinary deposit for red cells, pus cells, or casts Motile coliform organisms are often seen, but are not of significance unless the urine was passed by catheter into a sterile container Red cells are seen as small round, doubly refractile bodies Pus cells are slightly larger, are not so refractile, and have a granular cystoplasm

and often a crenated edge. Casts are at first difficult to recognize and to distinguish from cotton-wool fibres or other cellular material in the urine Casts are cylindrical bodies, ¼–1 mm in length, sometimes hyaline and homogeneous, sometimes made up of packed cells

SUMMARY

Listen carefully to the patient's story and inquire about all aspects of urinary function—the quantity and quality of urine, and the ability to pass it normally

Examine the abdomen, particularly in the kidney regions, the external genitalia, and the inguinal lymphatic glands Make a rectal examination and examine the central nervous system, if necessary.

Lastly, examine the urine, first with the naked eye, then by physical, chemical, and microscopical methods

CHAPTER IX

THE NERVOUS SYSTEM

It is not your Chief's responsibility to teach you anatomy or physiology; nor, fortunately, is it ours But it is our concern to insist that you must never lose that familiarity with the broad principles of these subjects which you have laboured until now to acquire

On the basis of this knowledge the great bulk of nervous diseases can be understood and diagnosed, without it you will find that they must remain irrational and uninteresting Diagnosis based on empirical facts is an unsatisfying substitute for diagnosis which rests on an understanding of structure and function

You should, for example, know the ways in which lesions affecting *upper and lower motor neurones* differ What you have learnt about the *tracts in the spinal cord*—their relative positions, the directions they take, their connexions, and their functions—is vital in the diagnosis of many nervous diseases It is equally essential to remember the *localization of functions in the brain* and the *paths of the tracts in the internal capsule*

"Writing maketh an exact man '—try to write down what you know about the examples we have chosen, or, better still make diagrams to illustrate them It is encouraging to note, how few, and how elementary are the examples quoted—only four so far You may add to this irreducible minimum as you find it necessary, in this chapter we propose to illustrate very few additional examples

Not only your interpretation of physical signs, but even the methods of eliciting them, may depend on your knowledge of anatomy and physiology In the following section let us consider the reflexes from these aspects

THE REFLEXES

Knee-jerk—The knee-jerk is taken as an example and will be discussed first in some detail

Mechanism.—The knee-jerk is a 'stretch reflex' (*Fig.* 55). A sharp blow on the ligamentum patellæ stretches the quadriceps muscle. As a result, the sensory nerve-endings in the muscle are stimulated, and afferent impulses pass to the spinal cord at the level of the 3rd and 4th lumbar segments. From

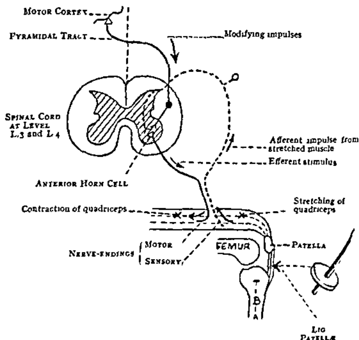


Fig. 55.—Diagram to illustrate the knee jerk.

the anterior horn cells in which the afferent nerves end an efferent stimulus passes down to the motor-fibres serving the quadriceps, and gives rise to a contraction. At the same time a stimulus passes to the antagonistic muscles, so that the hamstrings are simultaneously relaxed. Passing down the pyramidal tract impulses constantly lessen muscle tone, so that in normal health the 'stretch reflex' is a moderate one.

Practical Applications.—Obviously any force which stretches the quadriceps may produce the reflex, but a short, sharply

applied force will be most effective The position of the leg is important, it is advisable to ensure that the leg muscles are completely relaxed, so that the quadriceps is in the optimum position to respond to stretching while the hamstrings do not inhibit the resulting movement These requirements are best met if the knee is flexed at a right angle, and if the ligamentum patellæ is struck sharply. If relaxation is difficult to obtain, the patient's attention should be diverted, as by forced pressure of one hand against the other

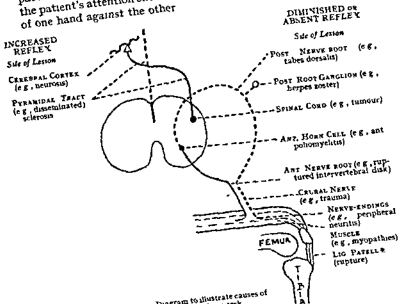


Fig 56 —Diagram to illustrate causes of alterations in the knee jerk

When the knee-jerk is weak or absent remember to feel the quadriceps, contraction of the quadriceps is the essential feature, and the extension of the knee is only secondary to it

Alterations in the Knee-jerk —The accompanying diagram (*Fig* 56) illustrates some of the causes of alteration in the knee-jerk not as a diagnostic list, but to remind you of possible abnormalities while you are carrying out the test

attributed to lesions of the pyramidal tract.

You will see from the above diagram that alteration in the knee-jerk is of great help in a large number of diseases. What the disease is in any particular instance you can determine by finding additional evidence; the greatest value of the knee-jerk, as of other reflexes, is in localization of lesions, but to make the most of this important aid the test must be correctly carried out.

Other Reflexes—The accompanying diagram (*Fig.* 57) *summarizes the other common reflexes Again it is emphasized* that position is important, and the part to be struck (for deep reflexes) or stroked (for superficial reflexes) must be accurately known The corresponding segmental levels in the spinal cord are indicated in brackets By examination of the reflexes, as you will see, you have a method of checking the functional integrity of the cord at various levels throughout its length.

The plantar response is so important that it merits more detailed attention An 'extensor response' is always abnormal, except in infants until they begin to walk With a true extensor response the big toe goes slowly up, while the remaining toes fan out, at the same time the hamstring muscles may be felt to contract Try not to use the term 'doubtful extensor', if you are in doubt, try the test again with the knee extended, and after warming the foot by brisk rubbing, and compare it with the response of the other foot If you cannot elicit a definite sign say 'no definite response obtained'.

CENTRAL NERVOUS SYSTEM EXAMINATION

You must aim at making a routine of the correct methods of examination, this can become a habit if you repeatedly watch and imitate the practised physician at work

Assessment of Mentality.—A considerable part of C N S examination entails the co-operation of the patient Neither a comatose patient nor an infant can provide this co-operation, and diagnosis in these cases is correspondingly more difficult Where the patient can reasonably be expected to co-operate, however, you must know to what extent his efforts are reliable,

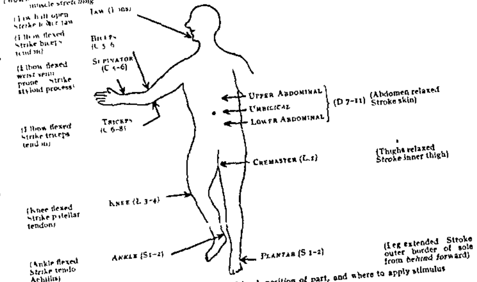


Fig 37 —Muscle reflexes To show segmental level, position of part, and where to apply stimulus

for this reason you must obviously make a preliminary assessment of his mental capacity, and you can estimate it quite well during the course of your conversation

Observe how the patient responds to your gambits Does he understand your meaning?—the senile or mentally defective patient may do so only with difficulty. Is he unduly exalted or depressed, or nervous, or resentful? Is he reasonably well orientated, or incoherent, or does he show the 'flight of ideas' associated with mania? Does he contradict himself, or is his memory markedly defective as in G P.I.? During your conversation you will be able also to note the presence of speech defects, such as the jerky speech of disseminated sclerosis

Train yourself to record such details, consciously at first, and later these observations will be made swiftly and automatically

Physical Assessment.—As in any examination, the patient must first be considered as a whole (*see* Chapter III) You should observe him talking, moving walking, and so on; disturbances of gait and posture, for example, may give you an early clue to the underlying condition. Once you have the patient in perspective you can proceed to examine him from top to toe It is customary to separate the various components of the C N S, such as the motor system, sensory system, and so on, but in actual practice these various aspects are considered together in each part of the body as it comes under examination

Turning next to detailed examination, we suggest that the orderly routine of inspection, palpation, and percussion should be borne in mind The tendency of students is to rest content if they have belaboured their patients with percussion hammers, dazzled them with lights, and goaded them with sharp instruments, as if examination of the C N S were peculiarly different from examination of the rest of the body. This outlook is to be deplored Allow yourself time to examine completely and in the correct sequence Inspection and palpation must come first, testing the reflexes should follow, since it is, in a way, a form of percussion

DETAILED EXAMINATION

The expression and mobility of a patient's face are best appreciated from a distance Parkinsonism (*see Fig* 2) may

pass unrecognized unless you observe the patient as a whole Minor degrees of facial palsy, ocular squints, drooping of the eyelids (ptosis) with the compensatory wrinkling of the forehead above, are also best seen from a distance

In a *complete* examination you must try the functions of all the cranial nerves, the tests for which are briefly set out below. Very few of these tests may safely be omitted; the test for smell is, however, usually left out in the absence of a precise indication for it

1. Cranial Nerves.—

1st Nerve First exclude obstructive nasal conditions, such as the common cold Test for smell by using common substances, such as peppermint, which the patient can recognize.

2nd Nerve Note the size and regularity of both pupils To test their reaction to *light* shine a bright light on each pupil in turn, holding the light at the corresponding side so that it illuminates only one pupil at a time To test for *accommodation* ask the patient to look at your finger, held at a distance, then quickly to look at his own nose, while you observe whether the pupils contract

Now you should carry out *ophthalmoscopic examination* Efficient and easy use of the ophthalmoscope is entirely a matter of practice, if you can afford it, buy a good ophthalmoscope and use it every day on as many people as possible Learn to relax your own accommodation, and approach the patient's pupil from the side, not directly from the front, in order to minimize pupillary contraction Where a good view cannot be obtained the pupils should be dilated, but this is not usually necessary if the examination is carried out in the dark, either by darkening the room or by draping a dark cloth over both the patient's head and your own

The *optic nerve head* must be examined with great care, you will find it by following one of the retinal arteries Note four main features the colour, edge, depth of the cup, and state of the blood-vessels As large a part as possible of the retina should also be inspected, paying particular attention to the blood-vessels, and observing exudates or hæmorrhages

A rough test for *fields of vision* should be carried out It is based on a comparison between the patient's fields and your own Ask him to cover one eye with his hand, while you, seated directly opposite him, close your corresponding eye

As your test object use a piece of white paper, about 1 in. square, held in the nib of an ordinary pen Move it slowly from



Fig 58 —Ptosis left sided

the patient's field of vision at about the same time as into your own, unless he has a marked visual defect

3rd, 4th, and 6th Nerves Observe the presence of *ptosis* (drooping of the eyelid) (Fig 58) or any inequality in the palpebral fissures, if the difference between the two sides is only slight it may be unimportant because an asymmetry of the skull can produce it

Notice the presence of a *squint*, it may be due to muscle paralysis, and is then of diagnostic importance. It may, however, be due to relative divergence of the visual axes of the eyes, in this case the two eyes move equally well in all directions, though there is a constant divergence

When testing the *movements of the eyes* by asking the patient to follow your finger in all directions, look also for *nystagmus*, a wavering about the point of fixation Do not carry your testing finger too far to the side, because in that position you may produce equivocal movements even in normal subjects It is useful to bear nystagmus in mind when examining the fundus with your ophthalmoscope, in slight cases it may be best detected by the wavering of the patient's eye under ophthalmoscopic examination While testing for eye movements ask the patient if he sees double, and remember to test for convergence

5th Nerve Ask about pain and numbness in the face, tongue, and eyes Test the *sensibility to light touch* of the face, tongue, and cornea To test the *corneal reflex* (blinking when the cornea is touched) approach the cornea from the side with a wisp of cotton-wool, in order to avoid provoking the visual reflex The sensibility of the face to *light pin-prick* should also be tested in tabes dorsalis there may be loss of sensation over the nose and neighbouring skin

The *muscle functions* are assessed by palpating the masseters and temporal muscles on both sides while you ask the patient to bite Next ask the patient to open his mouth widely, with one-sided weakness of the pterygoids the jaw deviates to one side

Test the *jaw-jerk* with the mouth slightly opened, the normal response is almost imperceptible

7th Nerve Note carefully any asymmetry of the face, in

of the 7th nerve nuclei, supplying the muscles of the upper face An infranuclear lesion abolishes all movements on that side of the face, but a supranuclear lesion diminishes voluntary movements only of the lower half of the face, and permits emotional movements over the whole area

As your test object use a piece of white paper, about 1 in square, held in the nib of an ordinary pen Move it slowly from the periphery across the field of vision, repeating the manœuvre from various directions The patient's open eye and your own should stare one at the other. The test object should come into



Fig 58 —Ptosis left sided

the patient's field of vision at about the same time as into your own, unless he has a marked visual defect

3rd, 4th, and 6th Nerves. Observe the presence of *ptosis* (drooping of the eyelid) (*Fig* 58) or any inequality in the palpebral fissures, if the difference between the two sides is only slight it may be unimportant because an asymmetry of the skull can produce it

thin, papery scars of healed ulcers may be present on the outer aspect of the calves

Note the presence of contractures, or of wasting or any difference in size on the two sides At the same time the limb girdles should be inspected, in the muscular dystrophies wasting often commences in these regions An important observation to make at this stage is to note the presence of fibrillation, or twitching of bands of muscle-fibres A normal person may show fibrillation if he is cold, but if fibrillation is marked it indicates rapid wasting of the muscles, and in its most severe form is usually associated with the disease known as progressive muscular atrophy.

Next, examine the limbs for *ataxy* The 'finger-nose test', in which the forefinger is brought from as far away as possible to touch the tip of the nose, is the simplest of these tests and will also demonstrate 'intention tremor', a vacillation on either side of the object aimed at; but before you attach too much importance to minor deviations try the tests on yourself For the legs a similar test consists in placing the heel of one leg on the knee of the opposite leg and sliding the heel down the front of the shin Ataxy is usually due either to a cerebellar lesion or to damage of the sensory tracts, in the latter case it can be compensated by visual effort, so that ataxy which is caused by sensory loss is made appreciably worse if the eyes are shut

Now pick up each limb in turn, and move it, noting any abnormality in *tone* A spastic limb is resistant to movement and to bending at the joints, if tone is deficient the limb feels flabby and responds rather like a piece of string to shaking In Parkinsonian conditions jerky rigidity, described as 'cog-wheel' in type, is produced on flexing the joints.

Next test the limbs for *power* Get the patient to go through various movements—such as gripping your hand, flexing and extending the elbow, bending and straightening the knee against resistance—to estimate the power in each main group of muscles

Now carry out simple tests for *sensation* First outline any subjective sensory symptoms such as pain, numbness, or tingling, their precise distribution is frequently of great importance Next, test sensibility with pin-prick and cotton-wool in turn These tests need to be carried out quickly, or the patient's attention lapses and his answers become unreliable.

8th Nerve: Test hearing with a watch and by whispering, comparing the distance at which they are heard on the two sides With a tuning-fork compare air and bone conduction; when the patient ceases to hear the sound of the fork held at a short distance from his ear rest its base firmly on his mastoid process If air conduction is defective as compared with bone conduction the sound produced by the fork will then again become audible to him

Never omit examination of both ear drums

9th, 10th, 11th, and 12th Nerves: It is difficult to carry out precise tests for each of these nerves without special experience, but a few simple tests will suffice.

Ask about difficulty in swallowing, and whether fluids are regurgitated through the nose.

Note if the uvula is in the midline. Ask the patient to say 'Ah' while you observe if the palate moves symmetrically. Tell him to put out his tongue, and note if there is any wasting or tremor, comparing both sides, or if it deviates to one side Observe drooping of either shoulder or asymmetry of the scapulæ (lesion affecting the lower two-thirds of trapezius) Test the sternomastoids by asking the patient to touch his shoulder with the ear on that side, while you feel the muscle and compare its action on the two sides

To complete the examination of the head, palpate it for bony swellings which may be caused by tumour infiltration In infants it is extremely important to feel the anterior fontanelle and estimate its tension (*see* p 149) In infants and young, children it is also helpful to measure the maximum diameter of the skull

Before passing on you should test for neck rigidity (*see* p 147)

2. The Limbs —Look at the limbs before you pick them up to examine them You may observe *involuntary movements* in habit spasm the same set of movements is continually repeated, in chorea the movements are manifestly purposeless, vary from one part to another, and give the impression of being incomplete, in athetosis the movements affect whole limbs, as well as the trunk in many instances, and are writhing in character

Turn now to more detailed observation In syringomyelia you may see on the fingers scars due to burns, resulting from the loss of sensation to heat in this condition, in syphilis the

of reflexes may possess no diagnostic significance A full bladder also seems to produce anomalous responses Repeated stroking of the skin to obtain or confirm the responses appears to tire the abdominal reflexes, so that a decision should be made quickly.

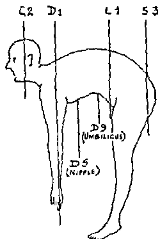


Fig 59 —*Sensory levels* Note that the sensory innervation of the body surface can be simply reconstructed by placing the body in the quadruped position

4. **Lumbar Puncture.**—The examination of the C S F is an essential part of the examination in the presence of disease of the C N S Its technique is described fully elsewhere (p 157) and must be completely mastered One warning is necessary, in the presence of raised intracranial tension the withdrawal of more than a small amount of C S F may be dangerous, so that lumbar puncture should not be done until papilloedema has been excluded by examination of the fundus oculi

SUMMARY

1 Certain essential facts of physiology and anatomy must be continuously borne in mind while you are examining the C N S

To assess deep sensation you will use tests which demonstrate the sense of *passive movement and of the position of the fingers* and toes For example, with the patient looking away, flex or straighten his fore-finger or big toe, and ask him to state whether it is or is not bent. Deep sensation is also assessed by testing perception to the vibration of a large tuning fork in large bones, such as the tibia, which lie immediately beneath the skin Small objects may also be placed in the patient's *hand and the patient asked to name them, or the tendo Achillis* may be forcibly pinched to ascertain if pain is felt Sensation to heat and cold is tested by the use of test-tubes containing hot and cold water respectively. They are applied to the patient's hands, feet, and trunk; but the difference in temperature must be clearly appreciable to you before you judge the patient by his responses

In infants pain is the only form of skin sensation which can be tested. This should be done by pinching the skin and noting if there is any resultant movement or crying; pricking the skin of infants is not to be encouraged, since they are so prone to infection.

The tests for sensation are useless unless certain elementary facts of anatomy and physiology are borne in mind The *distribution of the main sensory nerves in the skin must be known,* particularly of such nerves as the radial, ulnar, and medial in the arm The main segmentary sensory levels in the spine should also be known a simple diagram such as that in *Fig.* 59 will serve to refresh your memory

The reflexes should be tested in the manner already described, when all the foregoing tests have been carried out.

3 *The Trunk.—Extensive tattooing on the chest* is claimed by cynics to be as diagnostic as a positive Wassermann reaction, the pale scar of a chancre on the penis is a more certain sign, and you should look for it in any male in whom syphilis appears possible

Tests for sensory appreciation and for the abdominal reflexes are carried out in the usual way, with the same appreciation of *their significance* as regards the level of any underlying lesion The abdominal reflexes may be of limited diagnostic value A positive response is shown by deviation of the linea alba and umbilicus to the side of the abdomen which is stroked In obese subjects, or where the abdominal wall is lax, the absence

SECTION II

EXAMINATION OF ACUTE CASES

CHAPTER X

THE UNCONSCIOUS PATIENT

WHEN you are confronted for the first time with an unconscious patient your mind may be as blank as the patient's Deprived of the help afforded by the accustomed routine of history-taking and questioning, leisurely examination and investigation, you may despair The problem seems not only impossible to solve, but equally impossible even to comprehend Yet somehow, by observation and deduction, you must make a diagnosis and do something for the patient—and that without delay

If you had been fortunate enough to see your Chief or an experienced casualty officer dealing with such a case you would have noticed that he went about the examination swiftly, and with purpose behind every movement, very soon arriving at some satisfactory conclusion on which to base disposal and treatment How can you acquire a similar skill? By experience alone, some might say, and it is certain that without experience you will never become a master of your art Yet the ability to profit by experience—that of others, as well as your own—is important too, and with guidance it can be cultivated so that your path is made shorter and smoother

Probabilities.—The problem of how to examine an unconscious patient is [illegible] tangled with the problem of diagnosis It is, in practice [illegible] ible to make an intelligent examination unless you [illegible] what is likely to have occurred, in medicine, as [illegible] y is a good stick to lean on By diagnosing [illegible] Iceland you might gain a tremendous [illegible] would hardly last long

Alco[illegible] more cases of coma than all other causes [illegible] longer true Nowadays

2 It is important to carry out tests of the functional integrity of the C.N.S. in the correct, and not in a haphazard, manner.

3. First assess the patient's mentality, since on it depends the degree of his co-operation, and on his co-operation a large part of your examination is based.

4 Obtain a general impression of the patient; then examine him in detail from head to toe.

5 In the head and face, test the cranial nerves in orderly fashion.

6 Next examine the limbs, in each assessing the various functions (motor, sensory, etc.), and, lastly, examine the trunk.

7. Lumbar puncture may complete an examination which has revealed neurological disease

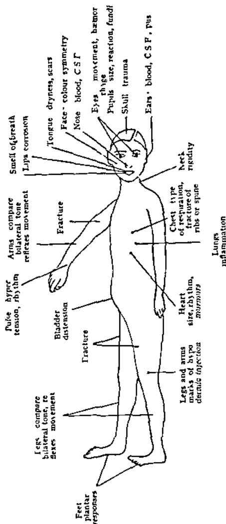


Fig 60 —Coma scheme for clinical examination

h

or opisthotonos At this stage also make a mental note of the type of breathing, to be confirmed later when you examine the the chest With severe injuries to the head or elsewhere the patient may be shocked · the colour is grey, the skin cold, and respiration is sighing. In coma due to diabetes or uræmia the patient may appear obviously dry and shrivelled, because of intense dehydration You are likely to miss these important clues unless you look for them before you commence your detailed examination.

3. **Depth of Coma.**—It is of prime importance to note the depth of coma, and you should assess it quickly according to some such simple scheme as this:—

Rousable Coma —The patient is able to make some attempt to obey simple commands, or to speak a few words in response to questions, or to drink and swallow.

Moderate Coma —The patient responds, by moving or grimacing, to unpleasant stimuli such as pricking the skin or firm pressure on the supra-orbital nerves

Deep Coma —Breathing is stertorous, and corneal and pupillary reflexes are absent The patient is unresponsive to stimuli

4. **The Head.**—An essential requirement of urgent examination is to obtain all the information possible from the part under scrutiny, then to pass on at once in orderly fashion It is wasteful of time to examine and re-examine according to systems, and you can train yourself to piece the clues together when you have finished We advise you, therefore, to examine the head first, then to proceed downwards, using all the senses you can—smell, sight, touch, and hearing

a. Mouth—Breath, Lips, Tongue.—A good nose will enable you to detect the characteristic *odour* associated with such conditions as diabetes mellitus (fruity), uræmia (urinary), and alcoholic coma But the smell of alcohol by no means always implies that the coma is due to alcohol

While deliberately smelling the patient's breath look at his *lips*, they may be discoloured by corrosive poison

Next, examine the *tongue* A good rule to remember is that if the tongue is dry coma is more likely to be due to a chronic disease whereas with a moist tongue an acute cause is more probable An epileptic may show scars where the tongue has been bitten during previous epileptic attacks

b Face.—Look carefully for *facial asymmetry* In a deeply comatose patient, with cerebral hæmorrhage, for example, unilateral facial paralysis shows by a sagging of that side, and the paralysed cheek flaps in and out with deep respirations.

The *colour* of the face may also afford some help Pallor or greyness suggests shock, usually due to trauma, while a red face is typically seen in diabetic coma

c Eyes —Inspection of the eyes often provides a clue to diagnosis early in the examination A *subconjunctival hæmorrhage*, for example, suggests the possibility of a larger hæmorrhage inside the skull, due to a fracture There may be *conjugate deviation* of the eyes, as in cerebral thrombosis or hæmorrhage, both eyes turning away from the site of the lesion while it is developing (though later on they tend to turn towards it) Compare the *size of the two pupils* with a cerebrovascular lesion, for example, one pupil alone may be dilated, and the dilatation is usually on the side of the lesion It is important to note whether both pupils are small, because, if they are, you must consider and look for further evidence of morphine poisoning, though some vascular lesions of the brain may produce the same effect In alcoholic coma, too, the pupils may be small, but in this condition they usually dilate if the skin is pinched firmly

The *optic fundi* are nearly always to be seen easily in comatose patients, and they may provide the most helpful evidence For example, papillœdema is evidence of increased intracranial tension, often due to a tumour or a characteristic retinitis may be present as in uræmia or diabetes mellitus or in hypertension This one examination, therefore, may provide a provisional diagnosis in many of the conditions which commonly give rise to coma

d Orifices Nostrils and Ears —Blood coming from one or both *nostrils* is strongly suggestive of a fractured skull, unless there is superficial trauma, and you should look *inside* both nostrils for it Blood from a fractured skull may however, have run back into the throat, instead of forward into the nose and you will have observed it when you examined the mouth

If there is no very obvious cause of coma, your examination is certainly not complete until you have examined both *ears* The presence of blood or of cerebrospinal fluid indicates fracture

of the skull. Inflammation of a tympanic membrane *is* important evidence which is often missed; it obviously suggests that the coma is due to meningitis or to a brain abscess arising from the inflamed ear.

e Skull.—Gently lift the head. At this time you can test *for neck rigidity*; it may be due to meningitis, but can also arise from intracranial hæmorrhage, or obviously from a broken neck, or even from severe bruising of the superficial tissues of the neck. If there is no neck rigidity you should be able to move the head so that the chin readily touches the sternum.

While the head is lifted—and notice that we advocate moving the head only at this late stage in the examination—look and feel all over the skull for *injuries* or *wounds*, but bearing in mind that the injury may follow and not precede the illness.

5. *The Limbs.—It is convenient next to examine the limbs.* It is, of course, best to have them completely uncovered, but at the time and site of an acute emergency this may not be possible.

Before you come to the obvious things, such as looking for a fracture or for spasticity or flaccidity, feel the *radial pulse*. It is satisfying to detect an undoubted increase in the blood-pressure and thickening of the artery, and these findings may indicate the cause of the coma, but do not stop at this stage, remember what happens whenever the intracranial tension is *raised—the blood-pressure tends to rise too, so that the* increase in blood-pressure which you have detected may be secondary and not primary. This sort of problem is what makes diagnosis *as fascinating as anything Sherlock Holmes had to do.*

While you are feeling the pulse look on the surface of the limbs for the marks of hypodermic injections, often visible in diabetics and occasionally in morphine addicts.

Next compare opposite limbs for *tone*. Immediately after a cerebral accident, for example, contralateral flaccidity may be present. In general, it may be said that in coma, flaccidity or spasticity is a useful guide only if it is unilateral. A similar generalization applies in the case of the *reflexes*, which should now be elicited, whatever the cause of the coma reflexes on both sides may be absent temporarily and both plantar reflexes

may still be a [illegible] n in [illegible] ut loss of movement

In mild coma the patient still responds to painful stimuli: if you press on a supra-orbital nerve he will move the unparalysed arm, and if you prick his legs or feet he will attempt to withdraw the sound limb

6. The Chest—Before examining the chest in detail pause again to study the *respiration*, which you first observed when you considered the general appearance of the patient A deep 'greedy' type of breathing is seen in diabetic coma, while in uræmia the breathing is sighing or hissing in character Irregularity of the breathing may occur with any severe intracranial disturbance, such as meningitis The periodic waxing and waning which constitutes 'Cheyne-Stokes respiration' is also seen with severe intracranial disturbances, it arises from such varied conditions as fractured skull or cardiac failure, for example, all of which probably produce this effect, you will remember, because of anoxæmia of the respiratory centre

Now palpate the ribs and spine in cases where there has been a serious accident, to determine whether there is a *fracture* of these bony parts

You will need to examine the *lungs* and *heart* with certain essentials in mind What you are seeking is evidence of some gross lesion which may have produced coma, for minimal lesions are not likely to produce so dramatic an effect In the lungs, tuberculosis, pneumonia, or an abscess may give rise to cerebral complications In the heart, several conditions which can be quickly recognized may produce similar effects, cardiac enlargement for instance, suggests hypertensive changes in the cerebral arteries, and auricular fibrillation indicates the possibility of cerebral embolism

7. The Abdomen—Very rarely you may discover an abdominal tumour, an indication that the coma is due to secondary neoplastic deposits in the brain Much more frequently you will find a *distended bladder*, it is no help in diagnosis, but will at least suggest one helpful form of treatment—the emptying of the bladder—and a further line of investigation by the examination of the urine

8 Body Fluids—

a Urine—No examination is complete until the urine has been examined You may need to obtain a specimen by catheterization, but the examination of the urine must never be omitted, and you should do it yourself without unnecessary

delay. The presence of a large amount of sugar and acetone will at once indicate a diagnosis of diabetes mellitus; any serious cerebral lesion may produce a slight, *transient glycosuria*, but the quantity of sugar present in the urine from this *cause is very small* With any cerebral lesion a trace of albumin may be present in the urine, but if albumin is present in considerable amount it suggests that the coma may be due to uræmia, and you must carry out *microscopical examination* of the urine for other evidence of renal disease.

b. Cerebrospinal Fluid.—Always carry out a lumbar puncture if, with coma, there is the least suspicion of neck rigidity, i e, the head cannot easily be flexed so that the chin touches the chest This essential precaution may enable you to diagnose a fulminating meningitis in time to save the patient's life by prompt treatment.

c Stomach Contents.—If no diagnosis has been made and you suspect poisoning, by a barbiturate for example, do not hesitate to wash out the stomach, and keep the contents for expert examination You will probably not come across many cases of coma due to barbiturate poisoning, but an appreciable number must be missed because of failure to carry out this simple precaution

SUMMARY

1. In the diagnosis of coma base your examination on probabilities
2. Obtain a history, if possible, from witnesses or relatives
3 Look at the patient's surroundings first
4 Before touching or moving the patient gain all the information possible from observing him
5 Assess the depth of coma
6. Examine the head very thoroughly in the order suggested
7 Obtain all the information you can from examination of the limbs
8 Examine the chest, including heart and lungs
9 Examine the abdomen
10 *In all cases* examine the urine Carry out lumbar puncture and examine the cerebrospinal fluid in any case where there *is neck rigidity*. If no diagnosis has been made and poisoning is a possibility, wash out the [illegible] nd keep the contents for examination.

CHAPTER XI

MENINGITIS

MENINGITIS is an acute medical emergency. Its diagnosis depends on the recognition of a characteristic 'meningitic syndrome' You must learn to recognize—or at least to suspect—this syndrome at an early stage in its development Cultivate the attitude of suspicion in this, as in any curable disease, so that you consider the diagnosis without waiting for the ominous late features The meningitic syndrome is not confined to conditions in which the meninges are actively inflamed, and in some cases your suspicions will prove unfounded; but you will not have wasted your time, for often promptness will save lives

THE MENINGITIC SYNDROME

The first essential in the diagnosis of meningitis is to be on the watch for it, the second is to understand the mechanism giving rise to the signs and symptoms which you can recognize.

The characteristic features are produced by *meningeal irritation* Compare the results of irritation of the meninges and irritation of the peritoneum, and you will see that they are strictly comparable In both the main features are (1) Pain, (2) Hyperæsthesia, (3) Muscular rigidity

1 **Pain**—In meningitis the pain is usually described as a headache, though pain may also be felt down the spine The headache is continuous, though it may fluctuate in severity, it may be deep-seated or referred to the surface, usually the back of the neck and occipital region, it is aggravated by movement or by coughing or straining, or by any test which stretches the meninges or increases the intracranial pressure The shrill 'meningitic cry' of an inarticulate child is probably initiated by severe headache, but is limited by the necessity to avoid stretching the meninges

2 **Hyperæsthesia**—Local and general hyperæsthesia may be present early, though evidence of this is not as a rule very precise The patient may resent touching of any part, but especially of the back of the head and neck

3 Muscle Rigidity.—This important sign is nearly always demonstrable. In the early stages it is often localized, and, since meningitis is commonly maximal at the base of the brain, neck rigidity is frequently present even when other signs are equivocal Later, the back may become rigid, the head retracted, and the thighs flexed on to the abdomen (*Figs* 61, 62).





Figs 61, 62 —The position in advanced meningitis.

Before going any further it is important to recall that though meningeal irritation, with its three characteristic features, may be, and often is, produced by infection of the meninges, it may be due to other causes It is of more than academic interest to understand and separate these causes, because otherwise your differential diagnosis will be irrational and may be misleading For example, many acute infections of childhood are accompanied by signs of meningeal irritation, although the meninges are not infected This condition, which is known as *meningism*, is commonest with pneumonia and tonsillitis

The accompanying diagram (*Fig* 63) has been drawn to show the different groups of conditions which may produce the syndrome of meningeal irritation

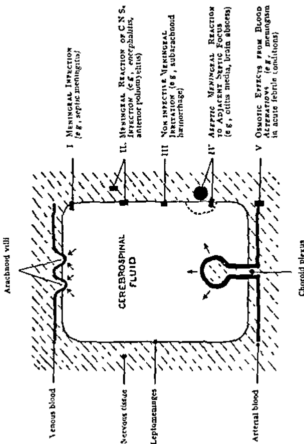


Fig 63 —*The pathogenesis of the meningitic syndrome*

The Complete Syndrome of Meningeal Infection —What has been said so far is essential for the understanding of meningitis,

and as a basis on which to plan your examination of the patient; but it broadens the discussion, and may seem to you at first glance to make the subject more difficult because of the many conditions which are included. It is now necessary to separate the group of conditions comprehended in the term 'septic meningitis', which includes infections by the meningococcus, streptococcus, staphylococcus, pneumococcus, *Bacillus coli* and *Hæmophilus influenzæ*. In septic meningitis the syndrome of meningeal irritation is only one part of the complete clinical picture, in the natural history of the disease process three stages can often be observed (1) Stage of invasion; (2) Stage of meningeal irritation, (3) Stage of raised intracranial tension, with irritative and paralytic phenomena. These stages are most clearly seen in slowly progressing cases, and they are best observed in tuberculous meningitis, but, in essence, most varieties of meningitis follow the same pattern, though the stages may overlap, or be compressed, if the disease progresses rapidly

1 *Invasion*.—Since most forms of septic meningitis are secondary to infection elsewhere, systemic effects may provide the earliest manifestations. For example, in the rare fulminating cases of meningococcal infection death from *adrenal failure* may occur within a few hours *Petechial eruptions* in the skin are also frequently observed, especially with meningococcal infections

But, whatever the infection, the first signs of the disease, occurring even before the signs of meningeal irritation, may be *changes in the mentality* In extreme cases, delirium may accompany a rise in temperature In mild cases the patient may be languid and irritable A common combination is that of irritability alternating with drowsiness It has been said that if you pull the blanket off a patient with typhoid he will not blink an eyelid, whereas a meningitic patient will replace the blanket with an oath Think of meningitis whenever you see a patient who has developed acute mental confusion with a raised temperature

2 *Meningeal Irritation*.—The three essential features of meningeal irritation have already been outlined Among these, headache and unwillingness to flex the spine are of outstanding importance because they occur so constantly

The type of *headache* should be remembered In meningitis it is continuous and, unlike a 'feverish' headache, does not

vary with the degree of pyrexia. There are, of course, innumerable varieties of headache. Learning them off parrot-fashion would be as useless to you as a list of the names of King Solomon's concubines to a theology student. Instead, learn from your clinical experience.

Unwillingness to permit flexion of the spine is of vital importance in diagnosis, and a host of eponymous signs has been described to demonstrate it. All depend on stretching the meninges and thereby increasing meningeal irritation. We have found that the demonstration of *neck rigidity* is the most simple and clear-cut of all, but you should try it out and compare it with other signs before you decide for yourself.

To demonstrate a slight degree of neck rigidity, ask the patient to touch his chest with his chin. In the earliest stages he may succeed, but complains of pain in the back of the neck, and at the same time you will feel stiffness of the muscles in this region. At a later stage of the illness he will be quite unable to reach the chest with his chin, if you try to do it for him he will cry out with pain, and you will feel in the neck an unmistakable resistance to flexion. With a child, or an unconscious patient, with your elbows resting in the bed on either side of the patients' shoulders, place the palms of your hands under the patient's head and gently lift it. Even minor degrees of resistance can be felt in this way. In severe cases the head hardly flexes and you may find yourself lifting the shoulders, and, indeed, the whole body, off the bed. This can be very strikingly seen in children, who may be raised like a board until only the heels remain on the bed.

There are other useful methods of demonstrating resistance to spinal flexion. The patient may be asked to sit up in bed, and does so with both arms outstretched stiffly behind to take the weight off the spine and prevent its flexion: this is called the '*tripod sign*', and is frequently seen in the early stages of anterior poliomyelitis when irritation of the spinal meninges occurs. Or a child may be asked to kiss its knee and fail to reach it, this sign is also demonstrable when the spinal meninges are involved.

Another method of demonstrating resistance to spinal flexion is by *Kernig's sign* (*Fig. 64*) but it is often difficult to assess accurately unless the underlying disease process is advanced. Kernig's sign is best elicited by first flexing the hip, and only

then attempting to straighten the knee In the presence of meningeal irritation the spinal flexion produced by this manœuvre produces pain, extension at the knee is resisted, and the hamstring muscles go into spasm These results constitute a 'positive' Kernig's sign.

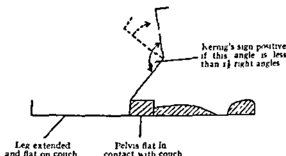


Fig 64 —Kernig's sign

3 *Raised Intracranial Tension, with Irritative and Paralytic Phenomena* —With the natural development of meningeal infection, certain mechanical factors come later into operation As the infective process spreads on the brain surface irritative phenomena occur, the exudate may become organized, obstruction to the flow of C S F. may occur, and the final picture is that of increasing intracranial tension, with failure of cerebral function

You may observe the classical features associated with *raised intracranial tension*—headache, vomiting, and papillœdema, though as a rule papillœdema does not have time to develop *Cerebral irritation* may produce convulsions or muscle twitchings, and the pulse and respiration may become irregular *Depression of cerebral function* may show as strabismus, inequality of the pupils, paralysis of the limbs, coma, and finally death

Meningitis in Infancy.—On page 143 the similarity between meningeal and peritoneal irritation was stressed, the analogy can be carried still further You will recall that in young infants the signs of peritonitis may be extremely vague or even absent, similarly, those of meningitis are atypical and may be misleading

The clinical picture of adult meningitis occurs in young infants only at an advanced, almost terminal, stage of the disease. At an early stage you may suspect meningitis in any infant presenting fever, drowsiness alternating with irritability, failure to thrive, and possibly a 'meningitic cry', but the *anterior fontanelle* usually provides early and definite evidence. Examination will reveal an increase of pressure in the fontanelle which may precede the onset of neck rigidity by several days, enough, if detected, to make the difference between success and failure in treatment. Lumbar puncture and examination of the C S F will settle the diagnosis in cases which worry you.

SCHEME OF EXAMINATION

Long preparation ensures quick diagnosis. If you have followed and pondered over the previous part of this chapter you will appreciate all the preparation which goes to the making of an urgent diagnosis. Now let us build, on the basis of what we have already discussed, a practical programme of the essentials in examining a patient suspected of meningitis.

1 **General Condition.** Try at the outset to estimate the general condition of the patient as an index to the severity of the illness and as a guide to the degree of urgency of treatment.

A collapsed, cold child with the meningitic syndrome probably has a severe septicæmia (you will remember that meningitis is almost always secondary to infection elsewhere). He will not have long to live if treatment is not immediate and effective. The depth of coma if it occurs is an index of the severity of the illness.

2 **The Meningitic Syndrome.** Examine the patient to determine what degree of meningeal irritation is present, carefully carrying out the simple tests which have been described above.

3 ***Temperature, Pulse, and Respiration.***—These should of course be noted and recorded; any changes which occur may guide you both as regards treatment and prognosis.

Either a very low or an excessively high temperature is an ominous sign. The temperature may rise steeply when death is imminent.

Slowness of the pulse in relation to the temperature may occur if the intracranial tension is high; on the other hand the pulse is weak and extremely rapid if septicæmia is present.

Rapid respiration should suggest the possibility of pneumonia. This may occur as an accompaniment of meningitis, but remember that in children pneumonia alone is often associated with meningism (*see* p 145). Irregularity of respiration may occur in any severe meningitis and is very common in the late stages of the tuberculous form

4. **Skin.**—Since meningitis is often secondary to infection elsewhere, look for a *septic focus* in the skin A 'boil' on the lip or in the nostril may be of significance

Any severe septicæmia is likely to produce a petechial rash on the skin; this occurs much more frequently with a meningococcal than with any other variety of meningitis. The *types of rash* which occur with meningococcal meningitis are extremely varied, but they have one feature in common: somewhere you will find evidence of a minute hæmorrhage in the skin. There may be a few of these petechiæ on the dorsum of the foot and nowhere else, but more commonly they occur also around the elbows, wrists, and other joints, on the flanks, and in the sacral region

5. **Skull, Nose, Ears, and Throat.**—Still hunting for a primary infective focus, examine these regions carefully. You may find evidence of abrasions or a fracture, or a purulent discharge from one nostril which suggests a severe sinusitis Much more commonly, however, the examination of *both* ears, not merely one as a token, will reveal the causative inflammatory process Until you have seen both ear drums you have *not* properly examined any case of suspected meningitis *In children*, acute tonsillitis may be found, very rarely this is the source of a streptococcal meningitis, but remember that simple tonsillitis *may cause meningism*

6 **Neck.**—Examine the neck for rigidity and for enlarged glands suggesting local sepsis.

7 **Chest** — Pneumonia may cause or complicate meningitis, though in young children meningism is a more likely complication of pneumonia Lesions in the lungs may also occur in tuberculous meningitis

8. **Abdomen.**—May be retracted The enlarged spleen of septicæmia may be too soft to be felt

9 **Bones and Joints.**—If you have failed to find a primary focus examine the bones and joints for evidence of infection.

10. **C.N.S Examination.**—Owing to the patient's condition it is generally impossible to carry out a detailed examination

longer to get the patient into the correct position than to puncture his theca. See that your assistant flexes the patient's knees well into his abdomen, and flexes the whole spine well, to open up the intervertebral spaces for you (*Fig* 65) Clean the skin over the lumbar vertebræ with two or three changes of spirit Pause to make sure that the spine is in one horizontally straight line, preferably with a pillow to support the head in

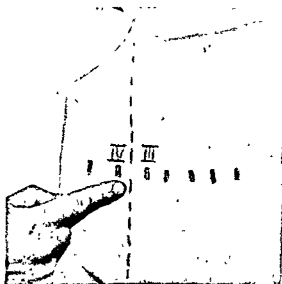


Fig 66 —Surface markings for lumbar puncture (finger pointing towards site of puncture)

this line Now make equally certain that the pelvis is vertical and at right-angles to the spine Dip a piece of sterile gauze in iodine, and with it make two lines on the skin—a horizontal one along the tips of the vetebral processes, and a vertical one down from the most cranial part of the uppermost iliac crest These two lines should cross at right angles at about the level of the fourth lumbar spine, and your puncture may be performed either in the space immediately above or below it (*Fig* 66). Now infiltrate the skin over the space you select with 2 per cent

sterile novocain, and aim at producing a distinct wheal with the anæsthetic With the fingers of your left hand delineate the vertebral spines above and below the space again, at the same time confirming that the spine and pelvis have not altered their relative positions With a sharp movement penetrate the

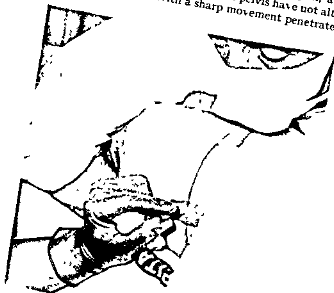


Fig. 67. Successful lumbar puncture

wheal and the skin with your lumbar-puncture needle making sure it lies between the vertebral spines and in the midline Holding the needle at its far end produces instability so hold the needle around its middle by a piece of sterile gauze and push forward and slightly cranially At this stage the commonest error is inadvertently to lower the head of the needle make sure your needle remains truly in the horizontal plane (Fig. 67) With your hand steadied on the patient's back, push the needle deliberately and you will feel a 'giving' sensation when the

dura mater is pierced (*Fig.* 68) If you are uncertain of the depth do not go on pushing, wait until you have withdrawn the stylet to observe if fluid escapes; if the needle goes too far and touches the anterior wall of the spinal canal it may pierce the venous plexus and so contaminate the fluid with blood. (If this mishap does occur, withdraw the needle slightly, to permit the bloody fluid to run out, and it may become clear) In children, and especially in infants, the common tendency is to push the needle in too deeply.

As soon as fluid is obtained replace the stylet and attach the manometer, avoiding flexion of the head at this stage, since it

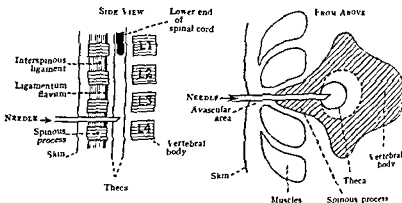


Fig 68 —Lumbar puncture

alters the C S F pressure, then withdraw the stylet to permit the fluid to flow into the measuring tube The normal pressure is 90–160 mm of water Get your assistant to compress and then release the jugular veins, when, in the absence of obstruction in the cerebrospinal space, the pressure will rise and fall quickly This done, disconnect the manometer, collecting the fluid which flows from it in your first specimen bottle for chemical tests In a further bottle collect 1–2 c c of fluid for cytological and bacteriological examination Then replace the stylet, and holding the skin down through a piece of sterile gauze, withdraw the needle rapidly

For accurate estimation of cells and organisms it is your responsibility to ensure that the fluid is examined within one hour of withdrawal

Naked-eye Appearances of C S F—It is unnecessary to wait for all your information for the pathologist's report, naked-eye examination may furnish enough information to enable you to start treatment at once

If the fluid is clear but under increased pressure let it run only slowly, urgent treatment is not so necessary, and rapid lowering of the pressure may produce the fatal 'pressure cone', due to depression of the cranial contents into the foramen magnum

If the fluid is slightly cloudy or frankly turbid let a drop fall on to a clean slide which is put aside for the time being Slight haziness is best detected by looking through the fluid in a small bottle or test-tube Haziness or turbidity almost invariably signifies a septic meningitis

The drop of cloudy fluid which you set aside will dry by the time you have finished the puncture, it can be stained very quickly and simply, and under the microscope you will almost certainly see a mass of polymorphonuclear leucocytes, and often the offending cocci, especially if they are extracellular (streptococci, staphylococci, and pneumococci) but less easily if they are intracellular (meningococci) If the fluid remains blood-stained, despite letting it run as described previously, try to determine whether the bleeding is due to faulty puncture or to subarachnoid hæmorrhage If the blood arises from accidental contamination, the specimens in successive bottles will not be stained to the same depth, and the supernatant fluid will be clear

SUMMARY

1 Learn to watch for and to recognize the meningitic syndrome at a very early stage

2 The essential and most constant features of the meningitic syndrome are headache and resistance to spinal flexion Mental changes or skin rashes may precede these and the signs of cerebral irritation or paralysis may follow

3 Separate true meningitis from conditions which simulate it by a careful physical examination especially for a primary focus and never omit lumbar puncture in any case of the meningitic syndrome

3 Lung conditions, such as pneumonia, abscess, empyema, or tuberculosis

4 Abdominal conditions, such as subdiaphragmatic or perinephric abscess, *tuberculosis, or renal infections*

5 Cardiac conditions, such as acute rheumatism, bacterial endocarditis or pericarditis

6. Septicæmias—often associated with pneumonia, meningitis, pericarditis, arthritis, or osteitis

7 Reticulo-endothelial diseases—such as glandular fever or leukæmia

8 Tropical protozoal diseases, such as malaria or amœbiasis.

THE HISTORY

Try to find out something about the patient's environment and occupation. certain infections are more common amongst the poor and badly housed A family history of infectious diseases such as 'sore throat' or tuberculosis may also prove an important diagnostic clue Ask the patient about his previous health, previous diseases, and especially about any sojourn in foreign countries

The Onset.—The time and the type of onset of the illness must be determined most accurately To do so it is necessary often to cross-question the patient and relatives with great persistence Like a lawyer you must press for details The first essential is to know the exact day on which the patient last felt well ate well, slept well, and worked normally This knowledge will usually enable you not only to say *when* the illness began but also *how* it began There are various possibilities For example, the onset may be abrupt the patient becomes ill suddenly on his way home from work (as in pneumonia or malaria) On the other hand, the onset may be rapid but not sudden, in which case the patient usually fights his illness for a day or so before taking to bed (as in typhoid fever) Lastly, the onset may be insidious, in which case the patient finds very great difficulty in stating just when he began to feel ill (as in most forms of tuberculosis) Make up your mind into which category the onset of your patient's illness falls You will find the knowledge of very great value in diagnosis

The rest of the history should be about the waxing and waning of the symptoms from day to day At the end you

should be able to make a list of the chief symptoms suffered in order of their severity, and be able to state exactly how long each one has been present

THE EXAMINATION

1. Taking the Temperature.—Most English clinical thermometers are measured in degrees Fahrenheit from 95° up to about 107°. The passage of the mercury column in the calibrated tube is retarded by a constriction which prevents the mercury column from dropping away into the bulb when the thermometer is removed from the patient to the cool air of a room. The patient's temperature can therefore be read at leisure. The mercury column must be shaken down into the bulb after use or else some careless person, possibly even yourself, will take the temperature of another patient with a thermometer which is already reading perhaps 102° F. To guard against possible mistakes by others always read the temperature *before* using a thermometer and always shake down the mercury column after use. In babies the thermometer should be greased, then placed in the rectum and held there for at least two minutes. Rectal temperatures are usually 1° F higher than oral, and about 1.5° F higher than axillary temperatures. In small children between the ages of 2 and 6 the temperature is most safely taken in the axilla or groin, the thermometer must be held in place while the arm is adducted or the thigh flexed so as to enclose the thermometer in a warm pocket of skin. Older children and adults can usually hold a thermometer with its bulb underneath the tongue. The thermometer must be left in place for at least two minutes, even though it is advertised as a 'half-minute thermometer'. By removing the thermometer after only half a minute an inaccurate unduly low reading may be obtained. Patients should be watched while the temperature is being taken, malingerers can, by various subterfuges, even produce a temperature reading of 106°. Remember that the 'normal temperature' of 98.4° is not really a normal but an average. One man's normal temperature may be 99° another's may be 97°.

If you are lucky enough to have a series of temperature readings taken during the forty-eight hours prior to your examination you can learn much by charting the readings and

studying the shape of the curve. Three main types of curve are recognized (*Fig. 69*), though there are many intermediate types:—

a. Intermittent Pyrexia.—Here the temperature is raised in the evening, but normal or subnormal in the morning. Low

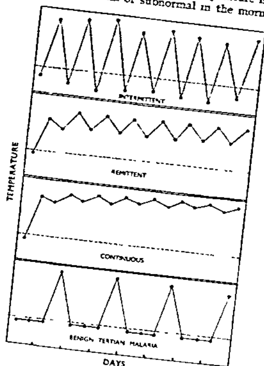


Fig. 69.—Temperature curves

intermittent pyrexia is common and may mean much or nothing at all. A high swinging intermittent pyrexia is always suggestive of undrained suppuration, septicæmia, or tuberculous infections.

b. Remittent Pyrexia.—Here the temperature varies by about 2° or 3° daily, but never reaches normal levels.

c *Continuous Pyrexia*.—The temperature remains high and varies very little during the course of each day.

'Diagnostic' temperature charts are obtained in certain tropical diseases, but the only one with which at the moment you need be familiar is the sudden rise of temperature every *forty-eight hours* which occurs in benign tertian malaria.

2 **The Pulse and Respiratory Rates.**—A considerable rise in the respiratory rate is always an important finding which suggests respiratory disease. This is particularly true in children, but first you must know what is the normal respiratory rate for a child of any given age. A new born infant's respiratory rate varies from 60 to 40 per minute, but falls to 30 per minute in a few weeks, gradually dropping to the adult rate in the course of years. Children's respiratory rates are readily increased by any disturbance and minor deviations from the normal may mean very little.

The relation of the pulse-rate to the temperature is a most useful ratio. Diseases vary in their capacity to cause pyrexia or tachycardia, some, like diphtheria, cause very rapid pulse-rate with only moderate pyrexia, others, like typhoid, cause a high pyrexia with a comparatively slow pulse-rate. The pulse-rate of an adult usually rises 10 per minute for every degree Fahrenheit above 98°. The expected pulse-rate for a temperature of 103° is therefore about 120. This general rule, however, must not be accepted too literally. The degree of tachycardia obviously depends on the patient as well as upon the nature of the disease.

3 **The General Appearance.**—Notice particularly whether the patient looks well in spite of the pyrexia, or whether he is dull, apathetic, and inactive. Excitement or mental confusion are usually obvious.

4 **The Head and Neck**.—(The upper respiratory tract comes last.) Look for evidence of cranial nerve palsies which may occur as a result of intracranial infections, and test for neck rigidity (*see* p. 147). Always remember to look for neck rigidity. With a child it is a good plan to make a game of it and ask the child to kiss its own knee. The child with meningeal irritation cannot do this. The adult should be asked to put his chin forward on to his chest.

5. ***The Skin***.—Some acute infections tend to cause generalized flushing, others cause pallor due to constriction of the

arterioles to the skin Look carefully at the colour and estimate the warmth of the skin around the face and hands, and notice the amount of sweating which is occurring A small infected wound, pimple, or boil, may have been the beginning of a severe septicæmia, so even these must be searched for carefully and noted Herpes simplex (herpes febrilis) in, which small clusters of vesicles form on the lips, may occur in any fever, but it is particularly common in pneumococcal and meningococcal infections

A good doctor can see a rash before his colleagues He knows where to look and how to look Most rashes begin with a mild erythema in macular formation (red spots, not raised above skin level, which blanch on pressure) and they cannot be seen except in a good light Look at the neck, the scalp, the post-auricular region, the chest, the abdomen, and the upper arms under these conditions Petechial spots (subcutaneous pin-point hæmorrhages which do not fade on pressure) are often first seen over the dorsum of the feet or at the bend of the elbows, but you should also look closely at the nails to see if there are any beneath them (*Fig* 70)

6 The Lymphatic Glands.—Palpate the neck, the occipital and pre-auricular regions, the axillæ, and the groins for enlarged lymphatic glands A small gland which is tender is of more significance than a slightly larger one which is painless Many children have palpable lymphatic glands, particularly in the upper cervical region, so do not attach too much importance to small painless palpable glands If any glands are felt note their size, shape, consistency, and attachments

7. The Joints and Bones—Examine the main joints not only for redness, swelling, tenderness and mobility, but also for peri-articular nodules The nodules of acute rheumatism may be found around the knee- and elbow-joints or along the palmar tendons and knuckles A special technique is necessary to demonstrate them flex the child's knees and elbows and let there be a good light upon them The nodules are more easily seen than felt If you think you see a nodule while taking care not to cast a shadow on it you should gently slide the skin so as to demonstrate the roundness of the nodule and its attachment to deeper structures

While examining the joints you should notice any redness or swelling or tenderness over the superficial bones In -

children it is also well worth while systematically to palpate the thighs, legs, arms, and spine in a search for tender areas Furthermore, *percussion* of the spine, and the ends of each long bone, may elicit evidence of deep-seated tenderness which



Fig 70 —A widespread rheumatic rash

could not be elicited simply by palpation Such deep tenderness may be the only pointer to early osteomyelitis.

8. The Chest.—Make a careful examination of the lungs and heart. Be especially careful and painstaking when examining the patient's lungs, remembering that *inflammatory lesions of the lungs may cause severe pyrexia and toxæmia without producing much in the way of local physical signs* A raised respiratory rate may, especially in children, be the only sign of a lung infection Unless you are very careful you may miss the slight percussion dullness, poor air entry, and ægophony at one lung base which indicate an empyema, or you may miss the generalized tinkling crepitations which are found in miliary tuberculosis

9 The Abdomen—Inspect and palpate the abdomen thoroughly The shape of the abdomen may be the best indication of the presence of ascites The abdomen containing an effusion bulges in the flanks, the umbilicus is stretched out to its full width, and the abdominal girth is increased Small quantities of fluid insufficient to cause an alteration in the shape of the abdomen are often equally difficult to detect by percussion

Make a special attempt to palpate the spleen (*see* p 107), but never diagnose splenic enlargement on the results of percussion alone.

10 The Upper Respiratory Tract—With a child this examination should be left to the last because your attempts to see into his nose, throat, and ears may provoke him to howl and to resist throughout the rest of your time with him Inspection of the throat and ears, therefore, come last in sequence, but not in importance

Look carefully at the child's tongue, noting whether it is moist or dry and the distribution of fur upon it Look for ulceration on the tongue and the inside of the cheeks and also for Koplik's spots (a grain of salt on an erythematous base) Then gently placing a tongue depressor in position and using a good torch, obtain a good view of the fauces tonsils, and posterior pharyngeal wall Experience alone can teach you how best to look into the throat of a difficult child, but we find it easiest from behind the child Try to make friends first and explain just what you are going to do before you do it With a child who is difficult wrap its limbs and trunk firmly in a

blanket You will then have a better chance of *getting that* clear view of the throat which is so essential

Next look at the ears. Inspect the pinna to see whether it is displaced forwards or swollen, then examine the skin over the mastoid processes Compare the effect of an even finger pressure over the mastoid antrum on the two sides *Use a good* auriscope to look within the ears This in children may be a difficult process and much resented, so use a speculum which is small enough for the child's external meatus and insert it very gently while pulling the pinna backwards A specially narrow speculum *is often necessary for baby's ears* If wax or debris obscures the ear drum, try gently to remove it with wisps of cotton-wool wrapped on the end of an orange stick. Don't be satisfied until you have really seen both drums

11. The Urine.—Look at the urine against the light If it shimmers and has a fishy odour, look at a drop under the microscope, for almost certainly it will then be found to contain large numbers of pus cells and motile coliform organisms In all difficult cases of pyrexia you should examine a centrifuged deposit for red cells, leucocytes, or casts Slight albuminuria by itself means very little, as it is a concomitant of most fevers

12. The Blood.—Examination of the blood is essential where the cause of the pyrexia cannot be determined by the history analysis and physical examination, and is always useful as confirmatory evidence of a clinical diagnosis The microscopical study of a blood-film is not only the most important part of this examination, but also the most easily done You can make a blood-film anywhere in the world if you have a glass slide and a needle

SUMMARY

Take the temperature accurately and compare it with the pulse and respiratory rate and the general state of the patient

Examine the external appearance of the head and neck and test for neck rigidity

Examine the patient's skin, minutely, and in a *good light*

Examine the lymph-nodes, the joints, and the long bones

Examine the heart, the lungs, and the abdomen

Examine the throat and then the ears

Examine the urine, and the blood if necessary

CHAPTER XIII

ACUTE BREATHLESSNESS

A DOCTOR is often called to see patients in the throes of respiratory distress The examination of such a patient, who is certainly too ill to be questioned much, is fraught with difficulties He cannot undress himself and attempting to do this for him may make him even more distressed, he is restless, and he grunts and groans frequently, so that inspection and auscultation of the chest are done under very trying conditions It is true that, as a student, you would probably see little of such a patient In hospital he would be seen and diagnosed on admission by the resident officer, students would be warned not to examine him in the acute stage lest the exertion which that would entail should jeopardize his condition

General observation of the patient's behaviour and breathing is at least as important in diagnosis as a more systematic examination of the body You can, therefore, begin to train yourself by watching such patients, and, in preparation for the day when you yourself will be faced with the urgent problem of diagnosis, rehearse the methodical steps you will then have to take in their examination Ideally, to find out the cause of acute breathlessness it is necessary to obtain as full a history as possible from the patient or his relative, and to follow this with a most thorough examination of the chest, cardiovascular system, and the rest of the body Overshadowing this ideal, however, lies the fact that unnecessary exertions are harmful for the patient, it would be absurd to test the muscular power and co-ordination of his arms after examination of his chest had already revealed the presence of heart failure In practice, therefore, the patient is both questioned and examined with a view to establishing a practical diagnosis as soon as possible, the finding of any one clue possibly altering the course of the subsequent examination Always as in most acute disease, the general observation of the patient and his behaviour is vital A clear mind, a knowledge of probabilities and the capacity to be certain about physical signs will be your chief weapons.

SCHEME OF EXAMINATION

History.—*You may* not be able to obtain a full history from such a very ill and distressed patient, and the relatives will probably be vague about details But in making your inquiry, *try to* determine a few essential facts Particularly important is the knowledge that the attack of dyspnœa is one of the following —

a A new event never experienced by the patient before

b The worst of a series of attacks similar to the one from which the patient is suffering

For example, the subject of emphysema or mitral stenosis is likely to complain of *gradually increasing breathlessness* culminating in the acute attack observed A *sudden attack* of breathlessness would suggest respiratory paralysis, pneumonia, or œdema of the glottis, whereas *repeated attacks* would lead you to think of asthma, paroxysmal rapid heart action, or hypertensive heart failure. Find out as much as you can about the onset of the breathlessness, whether it was sudden, slow, or insidious, and whether it was brought on by any factor such as exertion, trauma, or an infection

If the patient complains of pain, inquire about its character

You may not be able to obtain as much information as this but try to. After making sure of the essential points you can postpone the taking of more detailed history and proceed to examine the patient without worrying him about things he is too ill to remember

Colour —Pallor, associated with breathlessness, suggests some disease which by virtue of great pain or blood loss causes a state of shock (coronary thrombosis or hæmothorax)

Cyanosis is often most intense in conditions which prevent the proper ventilation of the alveoli in the lungs, but also occurs in lung infections and heart failure (owing to a mixture of various factors) Never decide that a patient is cyanosed after

seeing him in a poor light. Blue venules on the cheeks do not mean cyanosis

Bearing.—The patient may be alert and anxious, confused and apathetic, or even comatose. Pay particular attention to his *general condition and bearing, as these will affect the* prognosis as well as the diagnosis

Character of Respirations.—Count the respiratory rate, note the depth of the respirations, and watch for irregularities in the depth and rate of respiration, such as Cheyne-Stokes' breathing (periods of apnœa followed by hyperpnœa) The respirations may be sighing or hissing in character, as in 'chemical dyspnœa'; or they may be quick, short, sharp, and accompanied by grunting, as in 'reflex dyspnœa' Watch the patient's face for signs of pain at any phase of respiration

Inspiratory or Expiratory Dyspnœa?—You may notice inspiratory difficulty and an audible stridor in inspiration, or, on the other hand, you may find the patient struggling to expire, his efforts being rewarded by a feeble wheeze rather than a good blow out Look carefully at the chest to see in which position it tends to be fixed, the over-expanded position or the collapsed position When the patient breathes, look at the intercostal muscles to see whether they are sucked in on inspiration or even completely paralysed, and look at the upper abdomen to see whether the epigastrium is pushed out on inspiration as it should be by an active diaphragm, or whether it is sucked in on one side or the other, by the uplift of a paralysed diaphragm Look at the root of the neck, inspiratory obstruction leads to increased negative pressure within the *thorax and sucking in of the tissues above the clavicle at each* inspiration

It is a strange fact that even though a patient's chief difficulty is to *expire*, he will, in response to the feeling of breathlessness which this provokes, attempt to *inspire* even more *forcibly than before. Thus, a patient with asthma and spasm* of his bronchioles will attempt to expand his chest even further by contracting the accessory muscles of respiration—the shoulder-girdle and neck muscles—at each inspiration

Inspection and Palpation of the Mouth and Neck.—Look at *the lips, herpes simplex often accompanies inflammatory* conditions of the lungs Smell the breath and inspect the tongue. Frothy fluid in the mouth or throat may be found in

patients with pulmonary œdema Take the temperature, always remembering when you read the result that absence of pyrexia, especially in very old or very young people, does not exclude inflammatory conditions While the thermometer is in the patient's mouth, look carefully at his neck. if it is at all possible, let it be in a good light. If the patient is thin enough for you to see his external jugular vein, place the tip of your

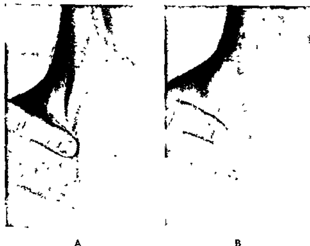


Fig 72 —Emptying of neck veins A, Finger obstructing external jugular vein, B, Vein empties when finger removed

forefinger on its lowest visible part so that it fills from above (*Fig* 72 A) Remove your finger, and if the vein empties well into the great vessels below you can safely say that there is no venous distension in the neck (*Fig* 72 B) The importance of this manœuvre lies in the fact that it is easy to be deceived by a visible vein into saying that it is distended, whereas, when your finger obstructs its lowest part, you will see at once that not only is it capable of much greater distension, but it empties freely when you remove your finger If the veins are truly distended gauge the vertical distance above the sternal

notch to which the level of distension rises, and this measurement in centimetres can be accepted as the jugular venous pressure

Examine both sides of the neck for enlarged glands or pulsatile masses, and determine the position of the trachea (*see* p 66). Look at the fingers while feeling the pulse The presence of finger clubbing suggests some long-standing pulmonary disease leading up to the attack of dyspnœa

Examination of the Chest and Heart.—Inspection, as always, is of paramount importance. A fixed, rigid, barrel-shaped chest suggests that bronchial spasm complicating bronchitis and *emphysema may be the cause of the patient's breathlessness* (*Fig. 73*), but the presence of such a chest deformity, so common in the general population, should not make you exclude other diseases from your mind Look for bulging of the intercostal spaces and diminished movement on one side, which would suggest air or fluid in a pleural cavity, and look for generalized or local inspiratory indrawing of the intercostal spaces which would suggest laryngeal obstruction or collapse of a lung

Determine the position of the apex beat, count the cardiac rate, and analyse abnormalities of cardiac rhythm if such are present If irregularity of rhythm is present, has that irregularity a rhythm of its own or is it totally irregular, as in auricular fibrillation? Compare the cardiac rate and rhythm with the pulse-rate and rhythm, noting at the same time any abnormalities of the pulse wave itself If tachycardia is present, *make several observations of the cardiac rate to see whether* it varies from moment to moment Thoroughly palpate the precordia and then percuss out the cardiac outline Never forget to percuss the right border of the heart if the apex beat is found to the left of its normal position, otherwise you may think a heart is enlarged when in reality it is only displaced to the left by some pulmonary condition—a mistake which might have serious consequences Nevertheless, such mistakes are often made through carelessness and failure to visualize the organs beneath the chest wall

When auscultating the heart, listen carefully to the heart-sounds themselves, asking yourself if they are as loud as they should be, if the first sound is louder than the second sound as it should be at the apex, and if there are any extra sounds producing a triple rhythm

Palpate, percuss, and auscultate over the lung fields at the front of the chest (*see* p 66) If adventitious sounds are present, determine whether they are heard in inspiration or expiration, and whether they are generalized or confined to one area



Fig 75 —Bronchial spasm chronic bronchitis and emphysema

Sit the patient forward getting him to clasp his hands around his bent knees If he is very ill you must get someone to hold him, a bed table or pillow for him to lean forward upon may be very useful First look for *œdema over the sacral region* this may not be obvious, so press gently with a finger over the

notch to which the level of distension rises, and this measurement in centimetres can be accepted as the jugular venous pressure

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C.N.S —If there is any indication of respiratory paralysis, *the nervous system must be examined*

SUMMARY

Consider the possible causes of acute breathlessness

Try to find whether your patient's acute breathlessness is a new event, one of a series of similar attacks, or the culmination of gradually increasing dyspnœa

Study the patient's colour, bearing, and respiratory activity.

Look at his mouth, neck, and fingers

Make a routine examination of the chest and heart, sitting the patient up only once to examine his back, and making certain to look for lumbar œdema at this time.

Find out all you can about any abnormalities of cardiac rhythm and take the blood-pressure

Examine the abdomen, the sputum, and the urine Examine the C N S if there if respiratory paralysis

sacrum for a few seconds and then stroke the area which has been pressed to see if you have left a depression there Look at the movements of the lower chest from above so that you can see the full posterior curve of the ribs, and test the relative expansion of the two sides by the method shown in *Fig* 32 Percuss the back of the chest lightly at first, to detect slight impairments of resonance, and then more firmly towards the bases to define exactly the lower limits of the lung resonance on each side Auscultate over the back of the chest with some care and elicit vocal resonance over the bases as a routine step, since ægophony in that region may be the only sign of a small pleural effusion

The Abdomen.—Inspect and palpate it. Gross abdominal distension may itself cause severe dyspnœa. Always feel carefully for enlargement or tenderness of the liver, since this is such a valuable sign of congestive heart failure.

The Blood-pressure.—When taking the blood-pressure (*see* p 38), let the column of mercury drop very slowly past the point at which the first sounds come through If the rhythm is regular and yet you find that half of the heart-sounds come through at a greater pressure than the rest, you are observing an alternating pulse (pulsus alternans), which is a very important sign of heart failure caused by the inability of the ventricle to beat with equal force at each systole

The Sputum —Always try to look at the sputum Anyone with severe breathlessness is liable to cough A light frothy sputum suggests pulmonary œdema; if the froth is tinged pink blood as well as plasma has exuded into the alveoli to discolour the œdema fluid Scanty, sticky, mucoid sputum is coughed up by asthmatics, whereas those with bronchitis often bring up a purulent or mucopurulent sputum The sputum of a patient with pneumonia is often scanty, purulent, and rusty-coloured, due to the presence of altered blood

suggestive of renal failure

flavour, smell, or noise, or flashes of light or complete visual hallucinations It is extremely brief, lasting only a few seconds as a rule

The aura is quickly succeeded by the next stage

2 *The Tonic Stage* —This may be immediately preceded by a cry, either of conscious terror, or the unearthly sound produced by inspiratory spasm drawing air over the vocal cords before they, too, go into spasm

The patient falls to the ground, wherever he may be, and the voluntary muscles may be seen and felt in tonic contraction The face sets rigidly with firmly closed jaws, the eyes turn up and out, the arms are flexed with the fists clenched, and the legs are stiffly extended Since respiration has ceased, cyanosis quickly develops

The duration of this stage is usually up to half a minute

3 *The Clonic Stage* —The muscles alternately relax and contract, so that whole limbs may flex and extend or the body move violently The intensity of the movements tends to increase quickly, then more slowly to diminish While the jaws are alternately clenching and unclenching, the tongue may be extended and bitten The patient may 'foam at the mouth' because saliva is extruded by the movements of the jaws The involuntary passage of urine, and more rarely of fæces, may occur

This stage may last from a few seconds to one or two minutes

4 *The Sleepy Stage* —As a rule, the patient passes into a stage of apparently natural sleep which lasts some hours, or he may merely feel sleepy, or complain of headache, or appear dazed and unreceptive Occasionally 'post-epileptic automatism' may occur, in which he may undress or behave viciously or queerly, without apparent volition or recollection

In most cases all the deep reflexes are temporarily abolished and the plantar responses are extensor These signs are of great importance as confirmatory evidence

MINOR EPILEPTIFORM ATTACKS

A minor epileptic attack is essentially a sudden break of a few moments in the continuity of consciousness It may or may not be noticed by the patient himself Without warning, the patient becomes suddenly still, though he does not fall

CHAPTER XIV

FITS

VERY frequently patients consult a doctor because of attacks in which they lose consciousness These attacks may be called by various fanciful names—'black-outs', 'faints', 'queer turns', 'coming all over queer'—and only rarely 'fits' Diagnosis has often to be based on the story of a relative, for the doctor does not often himself witness an attack For this reason you must pay even more attention than usual to the history, taking care to separate the important details from the irrelevancies with which it is certain to be larded

If the description obtained is vague it is worth while giving the patient or relative a short questionnaire, embodying the essential inquiries to enable you to make a diagnosis, and which should be answered after the next attack (*see* p 178)

Both your history-taking and your examination are based on probabilities, which cannot be disentangled from the problem of differential diagnosis A good way in which to start is to make sure you know the characteristics which enable you to recognize a major or a minor epileptiform attack

The first question you must attempt to answer is *Is the attack a genuine 'fit' or 'convulsion?'*

MAJOR EPILEPTIC ATTACKS

A 'Jackonsian attack' starts by localized twitching of one group of muscles, with a definite sequence of progression to other muscles, and finally to the whole body The site at which it commences indicates irritation of the part of the cerebral cortex which controls movements in that area

As a rule the common major epileptiform attack proceeds as follows —

1 *The Aura* – An adult often recognizes that a fit is about to occur, because of a preliminary sensation or aura which tends to be constant for the individual It may take the form of numbness or tingling in a limb, or giddiness, or a characteristic

flavour, smell, or noise, or flashes of light or complete visual hallucinations It is extremely brief, lasting only a few seconds as a rule

The aura is quickly succeeded by the next stage

2 *The Tonic Stage* —This may be immediately preceded by a cry, either of conscious terror, or the unearthly sound produced by inspiratory spasm drawing air over the vocal cords before they, too, go into spasm

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MINOR EPILEPTIFORM ATTACKS

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His expression is vacant, his face pale, and his eyes seem fixed After a few moments he may proceed with what he was doing previously, apparently oblivious to what has occurred, though sometimes he may be confused or hysterical for a short time

The description obtained may be extremely vague, but fortunately for the diagnostician who remembers his physiology a petit mal attack may be induced by overbreathing, the alkalosis resulting from overbreathing leads to over-excitability of the central nervous system The doctor holds a sheet of paper in front of the patient's face, and counts aloud from 1 to 100 With each count the patient blows forcibly at the paper In many patients with petit mal, especially in childhood, a typical brief attack is observed before 100 is reached

OTHER CONDITIONS

Fits and 'fainting' occur mainly in two main groups of conditions—*cardiovascular* and *cerebral* Let us consider some common conditions which resemble epileptiform attacks, to try to bring out the important points in which they differ Without this preliminary knowledge it is impossible to work out a rational scheme of history-taking or examination

1 Fainting (Syncope).—This may be due to postural or nervous causes, anæmia, or severe heart disease (e g, aortic stenosis) You should remember that (*a*) Fainting does not occur in a patient who is lying down, (*b*) Profuse sweating is constant, (*c*) Pallor is constant, (*d*) Nausea and vomiting frequently follows, (*e*) Occasionally there are clonic movements, but they are never more than a mild twitching, and tongue-biting does not occur

All these points can be elicited from the history In addition, if you see the patient during an attack you will observe that the pulse becomes very slow and may be so weak as to be imperceptible.

2 **Stokes-Adams Attacks.**—Repeated 'Stokes-Adams attacks' almost always develop on a basis of chronic heart-block Momentary loss of consciousness or major epileptiform attacks may occur, with cyanosis and convulsive movements Sweating, tongue-biting, and incontinence of urine very rarely occur The main diagnostic feature is extreme slowness of

absence of the pulse, a finding which should be confirmed by auscultation of the heart

3. Hysterical Attacks.—The keystone of differential diagnosis is that an hysterical attack simulates the convulsive but not the other features of epilepsy. There may be violent movements, but there is no cyanosis, tongue-biting, or involuntary micturition. During the attack the eyelids may be forcibly closed and tenaciously resist opening. A preceding aura and subsequent sleepy stage are absent. The reflexes remain unaffected throughout. Hysterical attacks are often brought about in dramatic circumstances, frequently in the doctor's presence, and between attacks the patient's personality may provide clues as to the condition

4. Feigned Fits.—These occur almost exclusively in unwilling Service personnel. To add verisimilitude to an artistic performance the patient may bite his tongue deliberately, foam at the mouth by dint of chewing soap and even ungratefully soil the trousers temporarily loaned by H.M. Government

5. Ménière's Syndrome.—Momentary collapse and unconsciousness may occur in this condition but they are preceded by a buzzing noise in the ears and intense giddiness, and vomiting is common. There are no convulsions

6. Intracranial Conditions.—Disturbances of brain function may be accompanied by fits. Some of the conditions causing such a disturbance are asphyxia, trauma, neoplasm, meningitis, encephalitis, vascular disease (as with hypertension), syphilis. Uræmia may also give rise to convulsions as may hypoglycæmia or hypocalcæmia. Such 'secondary' epilepsy is usually indistinguishable clinically from idiopathic epilepsy. An important point in differentiation from cardiovascular causes is that the pulse remains strong. Examination of the patient, and particularly the central nervous system, may reveal the underlying condition

INFANTS AND YOUNG CHILDREN

For some unknown reason fits are relatively common early life. Most of the causes already described in the case adults apply also to young children but some others desc special mention

1. Fevers.—At the start of any feverish illness a child throw a fit or a series of fits. This group of causes prob

accounts for more fits than all other causes together in the first few years of life. The fits fall into the group of major epileptiform attacks Your first task is, therefore, to attempt to demonstrate or exclude an underlying inflammatory lesion, such as tonsillitis, *pneumonia, otitis media, or meningitis*

2. **Brain Damage.**—In the first few weeks of life fits, of the major epileptiform type, are usually due to birth trauma or anoxia.

3. **Hypocalcæmia.**—Rickety children, generally between the ages of 6 and 16 months, *with a low blood-calcium, may* develop fits which are indistinguishable from epilepsy Only in very severe cases do signs of tetany, such as carpopedal spasms and laryngospasm, also become evident

4. **Pyknolepsy.**—In this condition a large number of minor *epileptic attacks occur in children who are otherwise healthy* A single attack is indistinguishable from 'petit mal', but the tendency to mental degeneration which may accompany frequent attacks of true petit mal does not occur

5. **Breath-holding**—This is seen in uncontrollable young *children Breathing suddenly stops, usually after* a bout of screaming, the body becomes rigid, and cyanosis develops. In a severe case the child loses consciousness and may twitch convulsively before finally becoming pale and relaxed

6. **Masturbation**—The flushed face and fixed, staring expression associated with the act of masturbation, and the pallor, exhaustion, and sleepiness manifest afterwards, may suggest epilepsy in children. It is unusual for the doctor to be able to observe an attack, but the thighs and genitalia may show evidence of friction

DIAGNOSIS

We have now considered some important, common causes of fits and similar attacks Any individual case must be considered from two aspects (*a*) *During the attack*—what type of attack is it?—epileptiform or otherwise, (*b*) *Between the attacks*—what is the cause of the attack?

a. During the Attack.—Details obtained from the history may, of necessity, have to replace those obtained by your own direct observation The information you should seek may be set out as a series of questions

1. Warning of attack? If so, what sensation and in what area of the body?

2 Onset of attack—sudden or gradual? Was there a localized twitching which became widespread?

3. Circumstances of onset—lying down or standing?

4 Presence of convulsions? Type and distribution.

5 Tongue-biting or other injury?

6 Incontinence of urine or fæces?

7 Colour of patient during attack? Pale, cyanosed, or plethoric

8 Perspiration?

9 Pulse-rate and tension?

10 Duration of attack?

11 Sequelæ of attack? Sleepiness, headaches, automatism

b. Between Attacks —Your aim is, in essence, to determine the *cause* of the attacks, having already obtained a description of the type of attacks

1 *Personality* —Try to assess the patient's personality. The patient who has suffered from idiopathic epilepsy for years may have a peculiar, hang-dog mentality, some part of which may be due to persistent drug-taking Mental deterioration, which may become apparent in epilepsy, occurs also in general paralysis of the insane or slow-growing intracranial tumours The hysterical patient may present a mild compliance which alternates with violent dramatization

2 *General Observation* —This is particularly important in children Take the *temperature*, and estimate the *pulse* and *respiration-rates*, they may provide valuable evidence of infection Also be on the look-out for evidence of anæmia and of rickets

Examine the *skin* and mucosæ closely for the prodromal signs of specific fevers and for suppurative foci

While examining the *mucosæ*, observe in the mouth undue dryness (as in uræmia), the pallor of anæmia, and the scars of a previously bitten tongue

Inspect the *throat* for inflammation, and palpate the cervical glands for confirmatory tenderness and enlargement

Examine the *ears* (*both* ears) making certain that you see both drums clearly

3 *Central Nervous System* —No part of the examination of the central nervous system can safely be omitted Remember

to look for evidence of meningeal irritation, and especially for neck rigidity (*see* p 147).

4. *Cardiovascular System* —Abnormalities of the cardiac rate and rhythm, the state of the peripheral arteries, and the blood-pressure are the most crucial features to observe.

5 *Remainder of the Body.*—Examine the chest and abdomen for inflammatory lesions.

6 *Urine* —Examination of the urine must never be omitted It may, for example, provide evidence indicating nephritis, uræmia, or pyelitis.

7. *Blood* —Blood glucose estimation should be done if there is the slightest suspicion of hypoglycæmia

SUMMARY

1. Before you are ready to examine a patient who suffers from fits, you should know the common causes of such episodes and their individual features. In infancy and early childhood fits occur more commonly than in adult life, and often for causes, such as acute infections, which do not apply in later life.

2 An accurate history is essential, since you may not have [illegible]

of questions and observations to this end

4 *Between attacks*· Your main concern is to elucidate the *cause* Examination must be systematic and complete, though directed, after the preliminary general observations, particularly to the central nervous system and the cardiovascular system

CHAPTER XV

THE ACUTE ABDOMEN

Few situations are so dramatic and so urgent of solution as that of the patient who is seized with abdominal pain and vomiting He presents his doctor with the twin problems of immediate diagnosis and early relief of symptoms To attempt relief before diagnosis is to court disaster, for premature treatment may obscure the clinical evidence on which diagnosis depends, and it is only correct diagnosis which can indicate the proper remedy It is true that sometimes the remedy can be found only after the peritoneum has been opened and the abdominal contents inspected by the surgeon, but it is equally true that there are many conditions causing shock, pain, and vomiting in which a fruitless laparotomy is undesirable, dangerous, or even fatal

Fortunately, there are many signs and clues from the history which can be relied upon Let us first of all define the 'acute abdomen' We mean any state of acute abdominal pain, shock, and vomiting which raises the *possibility of immediate surgical operation* Not every patient has severe pain not every patient vomits and in many the degree of shock varies as the disease progresses The detail of symptoms and signs will differ according to the pathology, but, because there is this over-riding question of early surgical treatment it is necessary to adopt an especially careful form of inquiry and examination in which symptoms and signs peculiar to certain pathological states are deliberately sought This is not a comprehensive book of diagnosis so we will avoid clinical dissertations, but set out instead a scheme of inquiry and examination in which your knowledge of anatomy and physiology will prove essential

Something, however, must be said about probabilities There is an old story that a houseful of resident officers planned to examine every acute abdominal emergency, singly and separately, and to record their diagnosis before operation or the course of events had clarified the picture Some were naturally more successful than others in this exercise, but one wily though indolent fellow didn t examine the patients at all but

simply wrote "Acute Appendicitis" for every case that came in. He won the competition by scoring the highest proportion of correct diagnoses. This story, however apocryphal, illustrates the point that acute appendicitis is not only very common, but also comes in various disguises, due not only to the varying anatomical position of the appendix, but also to the innate unpredictability of *visceral* sensation as experienced by different human beings at different ages. *Peritoneal* pain and the signs of peritoneal irritation, on the other hand, are so much more reliable in localization of a lesion, that tests for these assume great importance in the diagnosis of acute appendicitis and similar conditions where inflammation of a visceral organ spreads to involve the peritoneum.

HISTORY

The sex and age of the patient are important. Men don't have ovaries to become twisted or Fallopian tubes to rupture, and young people rarely develop carcinoma of the intestines, whereas in infancy the state of the mesentery readily permits the development of intussusception, which in later life becomes rare.

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... ther of position or ... its character ... ccord ... Any sub- ... type of pain must be noted.

If vomiting has occurred, it is important to find out whether it preceded, accompanied, or succeeded the first attack of pain. The reason is that obstructive lesions usually cause immediate pain, shock, and vomiting, whereas in inflammatory lesions pain and fever usually come first.

The frequency and character of the vomiting and the appearance of the vomitus must be studied. They are important because reflex vomiting due to pain or shock may be an immediate short-lived phenomenon or one which merges with nausea and retching, whereas obstructive lesions tend to cause recurrent and productive vomiting, the time of onset in relation to the pain depending on the site of the obs... ... obstructions vomiting is early. In low obs... may be late, but the vomit ...

has been no vomiting the occurrence or absence of nausea should be noted

Next, inquiry should be directed to the functions of the bladder and the bowel, the recent habit and performance and any noticed abnormality of urine or fæces should be recorded With women, never omit to inquire about the date of the last menstruation and whether it seemed normal or was in any way painful or atypical This is necessary because the complications of ectopic gestation may cause acute abdominal pain and shock

In searching back into the past history, inquiry should be made especially concerning indigestion, pain after food, or bleeding from the gastro-intestinal tract which might suggest peptic ulcer, jaundice (as with gall-stones), hæmaturia (as with renal stones), or previous loss of condition and weight which might suggest carcinoma

EXAMINATION

First record the radial and femoral pulses, the blood-pressure the temperature, and the rate of respiration It is wisest to measure these yourself rather than to rely on the observations of perhaps a relatively inexperienced nurse While doing so you will note the patient's general appearance and his colour whether he is sweating and rolls the bed in agony as in the case of intestinal, biliary, or renal colic, or whether he lies rigid as in cases of perforation and peritonitis

Inspection and Palpation —After the general examination you will turn to the abdomen itself Operation scars must be noted identified, and dated by inquiry The abdomen should be viewed carefully to find out how much the patient is able to move the diaphragm and the abdominal wall, and to note whether respiration is mainly intercostal, as it is with peritonitis Any inequality of the movement of the two sides of the chest should also be noticed Distension of the abdomen may be present, or rarely it may be hollowed and empty-looking Look for visible peristalsis (*see* p 101) Small intestinal peristalsis shows through the abdominal wall as a confused to-and-fro movement whereas colonic peristalsis is usually seen in the transverse colon as a right to left movement or as a localized bulging in the left iliac fossa

The patient is then asked to put his finger on the site of maximal pain, and to point to the site of origin of his first pain

if this is different. Palpation should be gentle and begin in the least painful area of the abdomen; you will note if there is any rigidity or tenderness of the abdominal wall. If the tenderness and rigidity are localized to a certain area, you must find out whether pressure on a non-tender area of the abdomen will, by stretching the parietal peritoneum, cause pain over the tender rigid area. Such a finding of what is called 'rebound tenderness', is diagnostic of localized peritoneal irritation or inflammation and, if present, it helps to narrow the diagnostic field. A mass may be felt in the region of the kidneys in cases of pyonephrosis or in the peritoneum when a carcinoma or granuloma has perforated. In infantile intussusception a sausage-shaped mass may occupy the position of the descending colon.

Hernial Orifices.—Next, the hernial orifices are inspected and palpated most carefully and most systematically. Unless you do this in every case, you will one day fail to diagnose a small strangulated femoral hernia, which is a curable condition if dealt with in good time. Insert a finger into both inguinal canals, and then feel laterally and below the inguinal ligaments to find the femoral artery and canal. Also palpate the umbilical area.

Tests for Posterior Abdominal Wall Irritation.—Having examined the hernial orifices, you should in cases of suspected peritoneal inflammation (as, for example, acute appendicitis), test for inflammation of the posterior abdominal structures by inspection and palpation of the loins and by putting the ilio-psoas muscle on the stretch. The last is done by rolling the patient onto the left side first and holding the right leg by the knee while attempting full extension of the hip. The manœuvre can then be repeated with the left leg while the patient lies on the right side. During these tests, the spinal column should be inspected and percussed for tenderness, because abdominal symptoms may be secondary to vertebral disease and nerve-root irritation. There is one further test for inflammation of the parietes which is to put the obturator muscle on the stretch by internally rotating the flexed thigh. Pain may be felt when there is pelvic peritonitis or irritation.

Percussion.—With the patient on his back, the abdomen should then be percussed carefully in a search for free fluid (*see* p. 104) and to outline the liver dullness. If there has been a perforation with leak of gas into the peritoneum, there may be no liver dullness and its absence, in the presence of

abdominal distension and free peritoneal fluid, is diagnostic of a gastro-intestinal perforation

Tests for Hyperæsthesia of the Skin —Central spinal excitation, accompanying peritoneal irritation, can produce changes in skin sensitivity at the back and front of the trunk The finding of such an area of hypersensitivity may be a thrilling diagnostic experience and one which can be of real value in clinching a provisional diagnosis, but it must be remembered that signs which depend so much on the patient's subjective sensations and powers of description can prove unreliable in practice

Auscultation —Auscultation is a very important art when dealing with acute abdominal cases A 'silent abdomen' with distension suggests ileus (paralysis of intestinal movement) and if rigidity is also present, the most probable cause of the ileus is peritonitis (or peritonism' due to the irritant affect of blood in the cavity) Ileus may also occur with localized peritonitis when pus is concealed beneath the diaphragm or deep in the pelvis A 'noisy abdomen' suggests an obstructive lesion, and peristalsis may not only be audible but visible (*see above*)

Rectal Examination —Rectal examination must never be omitted The feel of the pelvic peritoneum in peritonitis is characteristic and marked pain and tenderness is experienced by the patient Tumours and pelvic abscesses may be felt and blood may be found on the examining finger in cases of intussusception or carcinoma In women the genitalia are interposed between the rectum and the peritoneum and for this reason a vaginal examination gives more information on the state of the pelvic peritoneum and should, in any event always be done to determine the state of the genitalia

Chest and Heart Examination —Pneumonia and pleurisy affecting the diaphragmatic pleura may produce abdominal pain and rigidity and it is all too easy to misdiagnose these cases unless a careful examination is made Coronary thrombosis, too or acute rheumatic fever may cause acute abdominal pain as well as shock and vomiting A careful history and examination should minimize error but it is no good disguising the fact that in elderly patients especially it may not be possible to exonerate the chest and heart without a chest radiograph and electrocardiograph In these days such investigations if available must be done in order to lessen the chance

of a useless laparotomy in enfeebled high-risk patients It should also be remembered that there are vascular catastrophes of the abdomen, such as dissecting aneurysm, in which the pain starts in the chest or back and spreads to the abdomen and is accompanied by severe shock and alterations in the blood-flow to the limbs (main artery pulses may disappear) Mesenteric arterial or venous occlusion usually occurs in patients with other evidences of cardiovascular degenerative disease, and the picture is one of sudden pain, shock, distension, and ileus without localized pain or tenderness

Urine.—The urine must always be examined, and a specimen should be obtained by catheterization if necessary Diabetic coma with ketosis occasionally starts with abdominal pain and vomiting, whereas a substantial albuminuria should put you on your guard against the possibilities of uræmia or sepsis in the genito-urinary system The urine should be left to stand and looked at again after six hours if there is any suspicion of porphyria, in which the urine becomes cherry coloured on exposure

Central Nervous System—Abdominal crisis of pain arising from the nerve-root lesions of tabes dorsalis, now a rare disease, were an old snare for the unwary surgeon, and we should automatically test the pupils and the knee-jerks in all cases of sudden abdominal pain We may also look for evidence of myopathic weakness, in case of lead poisoning, which is also very rare but may be responsible for pain We should also consider the possibility that acute myositis, as in Bornholm disease, may be the cause of severe abdominal pain and muscular rigidity In such cases the muscular tenderness and rigidity are rarely confined to the abdominal wall, there is often a high temperature, and you may obtain a history of similar cases in the neighbourhood

Lastly, it must not be forgotten that a disorder of the emotions may produce the semblance of an acute abdominal crisis, possibly by the mediation of gut spasm or by contraction of the abdominal wall In cases of hysteria even fever may accompany the pain The diagnosis of such conditions is often difficult, the urgent surgical disorder *must* be meticulously excluded in every case

X-ray Examination.—If facilities are available, a film taken in the upright and supine positions will provide valuable

evidence of the localization of intestinal distension, or of free gas under the diaphragm It may also show renal or ureteric calculi It is not necessary in the commonest abdominal emergency of acute appendicitis

Blood Examinations —Acute pancreatitis is a condition which mimics acute perforation and sudden strangulations of the gut, but in which it is wisest not to operate It may be diagnosed clinically, as a result of the weighing up of evidence and probabilities, but great experience is required Fortunately, there is a simple biochemical test, the estimation of the serum-amylase levels, which is very helpful The finding of high levels, due to the sudden release into the blood-stream from the acutely inflamed gland of this enzyme normally destined for the duodenum, is diagnostic of acute pancreatitis

Leucocyte counts are rarely helpful but hæmoglobin and hæmatocrit values may provide useful collateral evidence of exsanguination or of dehydration with hæmoconcentration

SUMMARY

In acute abdominal emergencies the doctor's attitude of mind is conditioned by the fact that immediate surgical operation may be life-saving But first he must exclude certain general, thoracic or abdominal diseases which do not call for surgical treatment Hence the history must be careful and accurate and a general examination of the patient cannot be omitted

When the abdomen is examined, inspection comes first then palpation through the abdominal wall and through the rectum of the abdominal and pelvic contents The hernial orifices must always be examined Auscultation of intestinal movement is very important whereas percussion and tests for skin hyperæsthesia and muscle rigidity though sometimes useful, are of less importance

Some Conditions not requiring Surgery which cause Acut
Abdominal Symptoms

General	Thoracic	Abdominal	Spinal
Bornholm disease	Coronary thrombosis	Acute gastro-enteritis	Osteomyelitis or tuberculosis of spine
Herpes zoster	Pleurisy and pneumonia	Acute pancreatitis	Collapsed vertebræ
Uræmia	Dissecting aneurysm	Mesenteric arterial or venous occlusion	
Pyonephrosis	Heart failure	Mesenteric lymphadenitis	
Porphyria	Acute rheumatism		
Tabes dorsalis			
Lead poisoning			

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EXPIRED